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ABSTRACT

This curriculum guide is intended to assist vocational instructors in preparing students for entry-level employment in the field of horticulture and getting them ready for advanced training in the workplace. The package contains a validated competency/skill and task list, an instructor's guide, and an annotated bibliography. The following competencies are covered: understanding the basic principles of plant growth and development; propagating, growing, and maintaining nursery stock; mixing and applying horticultural chemicals; drafting landscape and irrigation plans; designing and installing irrigation systems; operating and maintaining sprinkler systems; designing, installing, and maintaining landscapes; constructing hardscape features; installing and maintaining residential and commercial turf areas and golf courses; operating and maintaining horticultural equipment; designing and preparing floral arrangements; selling and merchandising; managing a horticultural concern; developing desirable personal habits and leadership skills; and applying for a job. The instructor's guide consists of a series of task sheets, each of which includes some or all of the following: competency/skill statement; task statement; performance objectives (including conditions in which the task is to be performed, evaluation criteria, and an evaluation standard); suggested student learning experiences; recommended instructional techniques; instructional equipment, materials, and supplies needed to complete the lesson; and recommended resources. (MN)

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HORTICULTURE

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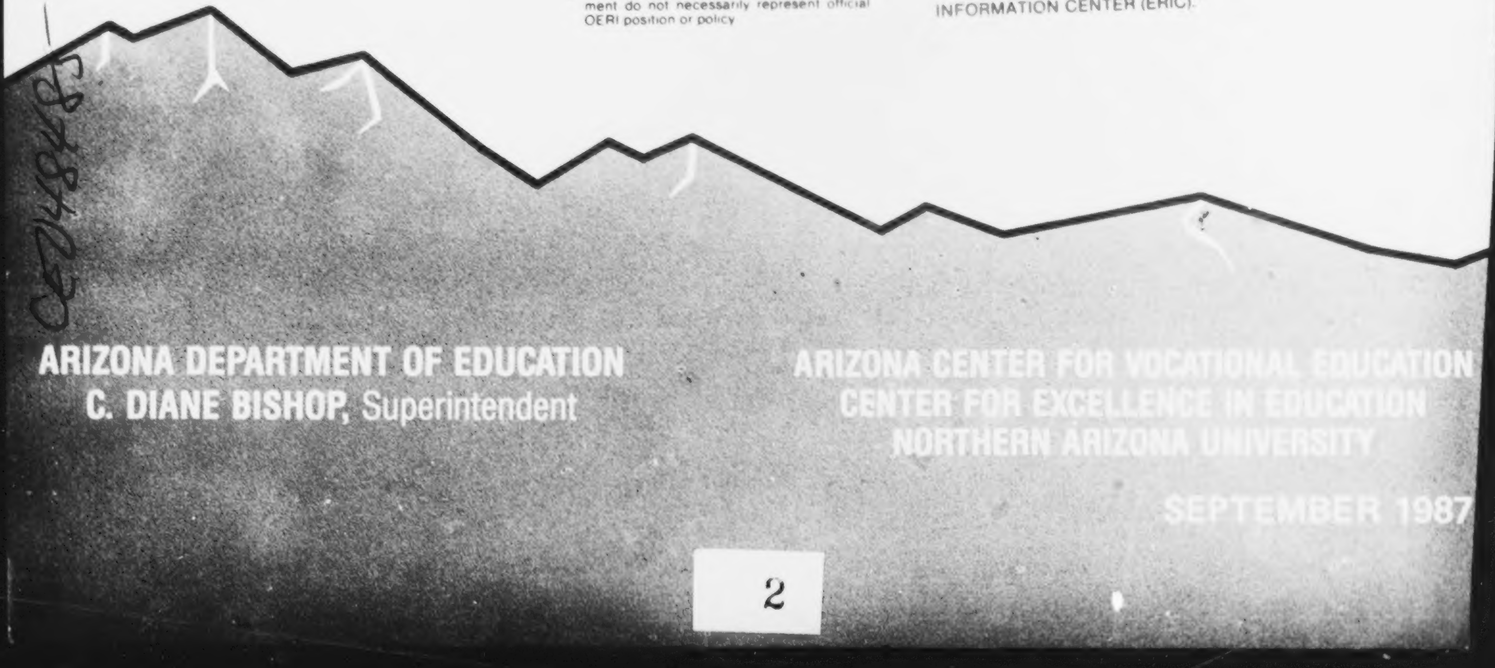

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Horticulture

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Arizona Center For Vocational Education
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September, 1987

FOREWORD

The Horticulture Competency Based Curriculum Guide has been developed for Vocational Agriculture Teachers at secondary and post secondary levels who are delivering programs in horticulture related fields: greenhouse and nursery operations, landscape and irrigation design, installation, and maintenance, and retail florist and garden center operations.

The guide is based on Arizona validated occupational competencies. Validated competencies have been used in curriculum design by both the Arizona Department of Education and the Community Colleges in Arizona, and this guide incorporates the newly developed articulated list of validated competencies for Horticulture.

Each page of the guide includes information related to a specified task within the competency. A strong effort was made to suggest STUDENT LEARNING EXPERIENCES which would not only provide information or skills basic to a task, but would also provided openings to view the activities in a broader business, social, or environmental context.

Given the nature of Arizona climate extremes and the fact that the majority of horticultural endeavor takes place in and around the desert population centers, much specific information referenced concerns adaptations and trade techniques used in this area. An effort was made, however, to remain conscious of and not slight appropriate material and techniques for Arizona's high country.

As horticultural businesses become increasingly sophisticated, students wishing to enter the trades at other than a labor level are likely to find that computer and business skills are keys to advancement. To that end, use of a computer to design, develop, record, or analyze should be encouraged wherever appropriate.

Finally, a sincere effort was made to maintain the integrity of the industry-validated competencies in the preparation of these materials. An instructor should be able to use this guide as a basis for instruction in Horticulture with the confidence that it addresses skills students need for employment in the field.

ACKNOWLEDGMENTS

The Horticulture Competency Based Curriculum Guide is the result of many people working together to insure quality curriculum for students seeking education and training in the agricultural occupations represented by the Horticulture Program cluster.

The initial review of existing curriculum materials for their compatibility with the state curriculum model and the state validated competency list for Horticulture was accomplished by Richard Sawyer, a Vocational Agriculture Horticulture teacher at Westwood High School and Mike Henry a former Vocational Agriculture teacher at Flowing Wells High School.

A committee of educators and business people was assigned the responsibility of determining if the existing curriculum materials reviewed by Richard Sawyer and Mike Henry could be adapted or adopted to meet our needs in Arizona. The committee determined that this was not possible in this curriculum area and we would need to essentially develop our won curriculum guide consistent with the state validated competency list and the state curriculum model. The committee consisted of:

HORTICULTURE CURRICULUM REVIEW COMMITTEE

Mr. Curt Bertelson
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Westwood High School

Mr. Dave Hanson
Peoria High School

Mr. Charles Van Meter
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Mr. Jim Claridge
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Progressive Plants

Ms. Josephine Teague
O'Malley's Lumber - Nursery Department

The curriculum guide was written by James Aitken, a licensed landscape contractor from Litchfield Park, Az. Tom Stroberger and Walt Berutto of Greenworld Nurseries and Ron Brady of Brady's Florist were most helpful in assisting Mr. Aitken with industry information. Additionally James Jackson and Heron MacCormack provided computer systems information and support which eased the writing burden.

Direction and leadership was provided by Richard Condit, Deputy Associate Superintendent Education, Doug Daley, Assistant State Supervisor of Agriculture, and Dave Muehlbauer, Curriculum Coordinator for the Arizona Department of Education. This has resulted in a guide which reflects the most current practices and procedures in this area.

We are grateful to the entire staff of the Arizona Center for Vocational Education for their support, concern and assistance. Special thanks to Dr. Jerry R. Cox, Nancy F. Dillon and the word processing operators Candice Dull, Carla Gahm, and Barbara Watson. Beverly Burns, an equity specialist with New Frontiers reviewed the material.

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TABLE OF CONTENTS

Page

Funding....ii

Foreword.... v

Acknowledgements....vi

Validated Competency/Skill And Task List....xi

Instructors Guide.... 1

Annotated Bibliography....313

Validated Competency/Skill and Task List

1.0 DESCRIBES BASIC PRINCIPLES OF PLANT GROWTH AND DEVELOPMENT.
1.1 Identifies plant parts and their functions.
1.2 Describes the role of water, air, light and soil in plant growth and development.
1.3 Describes asexual plant production.

2.0 PROPAGATES, GROWS, AND MAINTAINS NURSERY STOCK.
2.1 Identifies and describes various types of soil conditioning materials and their effects on soil characteristics.
2.2 Prepares proper soil mixtures for nursery stock.
2.3 Propagates plants from cuttings.
2.4 Selects quality seed.
2.5 Propagates plants from seed.
2.6 Transplants rooted cuttings and/or seedlings with 90% survival.
2.7 Waters containerized plants for optimum growth.
2.8 Selects and applies appropriate plant growth regulators to increase plant marketability.
2.9 Manipulates environmental conditions for optimum plant growth.
2.10 Selects appropriate plant containers.
2.11 Identifies and safely controls weeds in and around the greenhouse.
2.12 Identifies and safely controls insects in and around the greenhouse.
2.13 Identifies and safely controls diseases in and around the greenhouse.
2.14 Protects plants in outdoor growing areas from environmental extremes such as frost, direct sunlight, high winds, etc.
2.15 Transplants (shifts) containerized plants into larger containers without unnecessary plant injury.

3.0 MIXES AND APPLIES HORTICULTURAL CHEMICALS.
3.1 Interprets a fertilizer analysis.
3.2 Determines the amount of chemical required for a certain size area.
3.3 Operates application equipment such as pump sprayers, hose end sprayers, drop spreaders, and cyclone spreaders safely.
3.4 Handles, mixes, applies, and disposes of chemicals according to label directions.
3.5 Identifies federal, state, and local regulations governing the sue and disposal of horticultural chemicals.

4.0 DRAFTS LANDSCAPE AND IRRIGATION PLANS.
4.1 Identifies drafting equipment by name and function.
4.2 Draws landscape and irrigation plans to scale.
4.3 Prepares plans for blueprinting and presentation.

5.0 DESIGNS IRRIGATION SYSTEMS.
5.1 Determines available water pressure in pounds per square inch.
5.2 Determines available flow rate in gallons per minute.
5.3 Uses drafting equipment to draw a plot plan to scale.
5.4 Compares sprinkler, bubbler, and drip irrigation applications.
5.5 Reads and interprets sprinkler performance charts.
5.6 Locates sprinkler/bubbler/drip devices on a plot plan with proper coverage and overlap.
5.7 Selects appropriate sprinkler/bubbler/drip components.
5.8 Divides an irrigation system into appropriate circuits.
5.9 Locates pressure anti siphon device, control valves, and automatic timers on the plot plan.
5.10 Lays out system piping for maximum efficiency and minimum cost.
5.11 Identifies irrigation fittings.
5.12 Prepares a materials cost summary.

6.0 INSTALLS IRRIGATION SYSTEMS.
6.1 Taps into the existing service line.
6.2 Locates existing underground utilities.
6.3 Lays out an irrigation system on site.
6.4 Opens trenches by hand or with a trencher.
6.5 Measures, cuts, and assembles PVC, copper, galvanized pipe and polyethylene tubing.
6.6 Installs valves, pressure vacuum breaker, sprinklers, bubblers, emitters, and soaker tubing to specifications.
6.7 Mounts and wires automatic timer to control valves.
6.8 Tests and adjusts sprinkler spray patterns for proper coverage.
6.9 Backfills trenches.
6.10 Establishes final grade to proper height.
6.11 Prepares a bid.

7.0 OPERATES/MAINTAINS SPRINKLER SYSTEMS.
7.1 Determines appropriate start and run times for an automatic irrigation system.
7.2 Programs automatic timers.
7.3 Adjusts sprinkler patterns to maintain proper coverage.
7.4 Troubleshoots irrigation hydraulic and electrical systems.
7.5 Determines sprinkler precipitation rate in inches per hour.
7.6 Removes/repairs/replaces worn or damaged components.

8.0 DESIGNS LANDSCAPES (IRRIGATION SYSTEMS EXCLUDED).
8.1 Identifies basic principles of landscape design.
8.2 Identifies factors to be considered before beginning a landscape design.
8.3 Identifies landscape plants by common and botanical names.
8.4 Selects and locates plant materials on the plan using appropriate graphic symbols.
8.5 Selects and locates appropriate complements.
8.6 Makes preliminary sketches suitable for client evaluation.
8.7 Uses drafting equipment to draw plans to scale.
8.8 Develops a legend for a landscape plan identifying all plant materials, complements, and hardscape features.
8.9 Uses color to enhance finished plans.

9.0 INSTALLS LANDSCAPES (IRRIGATION SYSTEMS EXCLUDED).
9.1 Identifies states licensing regulations
9.2 Interprets landscape plans.
9.3 Estimates the total amount of materials needed to complete a landscape installation.
9.4 Contures soil surfaces to promote proper drainage and/or create a desired effect.
9.5 Installs plant materials so as to minimize shock and encourage plant growth.
9.6 Applies preemergence herbicides or black plastic to control initial weed growth.
9.7 Installs complements.
9.8 Cleans up the job.
9.9 Develops a bid for a landscape installation job.

10.0 CONSTRUCTS HARDSCAPE FEATURES.
10.1 Measures, cuts, and fastens lumber using nails and/or threaded fasteners.
10.2 Constructs forms for concrete.
10.3 Places, finishes, and cures concrete according to guide lines.
10.4 Lays block.
10.5 Lays brick.
10.6 Lays flagstone.
10.7 Cuts and sets ties and poles.
10.8 Stuccoes walls.
10.9 Selects, mixes, and applies paint to hardscape features.

11.0 MAINTAINS EXTERIOR LANDSCAPES (TURF EXCLUDED).
11.1 Identifies and corrects plant nutrient deficiencies.
11.2 Applies fertilizers and soil conditioners for optimum plant growth.
11.3 Identifies landscape maintenance tools by name and function.
11.4 Prunes trees and shrubs according to approved guidelines.
11.5 Stakes and ties trees to obtain desired growth.
11.6 Selects, mixes, and applies preemergence herbicides to prevent weed growth.
11.7 Identifies annual and perennial weeds.
11.8 Selects, mixes and applies contact herbicides to control annual weeds.
11.9 Selects, mixes, and applies systemic herbicides to control perennial weeds.
11.10 Selects, mixes, and applies insecticides to control insect pests.
11.11 Identifies and controls diseases of landscape plants.
11.12 Waters plants for optimum growth.
11.13 Operates and maintains chain saws, electric hedge shears, and blowers.

12.0 MAINTAINS INTERIOR LANDSCAPES.
12.1 Identifies interior plants by common and botanical names.
12.2 Locates interior plants by light requirements.
12.3 Cleans plant leaves.
12.4 Identifies and controls diseases and insect pests of interior plants.
12.5 Waters and fertilizes interior plants for optimum growth.
12.6 Replaces interior plants.
12.7 Trims interior plants for optimum growth and appearance.

13.0 INSTALLS RESIDENTIAL AND COMMERCIAL TURF AREAS.
13.1 Identifies turf species commonly used in the local area.
13.2 Identifies characteristics of turf species.
13.3 Selects appropriate turf species.
13.4 Installs turf using sod, stolons, plugs or seed.
13.5 Irrigates newly installed turf for optimum growth.

14.0 MAINTAINS RESIDENTIAL AND COMMERCIAL TURF AREAS.
14.1 Applies fertilizers and soil conditioners for optimum turf growth.
14.2 Identifies and controls common turf insects.
14.3 Identifies and controls common turf weeds.
14.4 Identifies and controls common turf diseases.
14.5 Mows turf to optimum height using a rotary mower.
14.6 Mows turf to optimum height using a reel-type mower.
14.7 Irrigates turf for maximum growth.
14.8 Operates a string trimmer.
14.9 Operates a power edger.
14.10 Dethatches/verticuts turf.
14.11 Overseeds Bermuda grass lawns with winter rye.
14.12 Performs routine maintenance on turf maintenance equipment.
14.13 Prepares a bid for a landscape maintenance job.

15.0 MAINTAINS GOLF COURSES.
15.1 Mows greens, roughs, collars, aprons, and fairways.
15.2 Removes and relocates cups.
15.3 Irrigates greens for optimum growth.
15.4 Applies fertilizers and top dressings.
15.5 Identifies and controls turf insects, weeds, and diseases.
15.6 Aerates turf.
15.7 Verticuts turf.
15.8 Overseeds turf.
15.9 Repairs divots.
15.10 Rakes, trims, and edges sandtraps.
15.11 Performs routine maintenance checks on turf maintenance equipment.

16.0 OPERATES AND MAINTAINS HORTICULTURAL EQUIPMENT.
16.1 Differentiates between two and four cycle engines.
16.2 Mixes fuel for a two cycle engine.
16.3 Recognizes visual and audible signs of equipment malfunction.
16.4 Adjusts equipment for optimum operation.
16.5 Performs routine maintenance as recommended by the owner's manual.
16.6 Operates and maintains tractors.
16.7 Operates and maintains trucks.

17.0 DESIGNS AND PREPARES FLORAL ARRANGEMENTS.
17.1 Identifies living and non living materials used in floral designs.
17.2 Spray tints both live and dried floral material.
17.3 Dip dyes live floral products.
17.4 Wires flowers.
17.5 Makes nets or fans and bows.
17.6 Identifies basic principles of floral design.
17.7 Designs artificial or dried flower and foliage arrangements.
17.8 Designs flower arrangements for display.
17.9 Designs flower arrangements to wear.
17.10 Designs flower arrangements to carry.

18.0 DEMONSTRATES SKILLS IN SELLING AND MERCHANDISING.
18.1 Meets and greets customers.
18.2 Asks appropriate questions to determine customer's needs.
18.3 Reads and explains product labels.
18.4 Identifies "tie-in" sales for merchandise.
18.5 Displays merchandise for optimum customer appeal.

19.0 PERFORMS MANAGEMENT FUNCTIONS FOR THE EFFICIENT OPERATION OF A HORTICULTURAL CONCERN.
19.1 Identifies the various organizational structures of horticultural businesses.
19.2 Describes the roles of licensing, bonding, and insurance in the operation of a small horticultural business.
19.3 Fills out an application for a business license.
19.4 Describes the role of credit in starting/operating a horticultural business.
19.5 Fills out an application for credit from a bank or other credit source.
19.6 Fills out individual and business tax forms for a horticultural business.
19.7 Develops goals for a small business.
19.8 Evaluates employee performance.
19.9 Develops employee training and work schedules.
19.10 Prepares bids.

20.0 DEMONSTRATES RECORD KEEPING SKILLS.
20.1 Develops a budget listing anticipated income and expenses.
20.2 Fills out a business agreement.
20.3 Prepares opening and closing inventories for non-depricable items.
20.4 Prepares opening and closing inventories for depricable items.
20.5 Records income and expense entries in a record book.
20.6 Calculates net profit for a business enterprise.
20.7 Distinguishes between assets and liabilities.
20.8 Prepares a net worth statement.
20.9 Summarizes records for a business venture.
20.10 Operates a calculator and computer.

21.0 DEMONSTRATES DESIRABLE PERSONAL SKILLS AND HABITS.
21.1 Listens and observes.
21.2 Follows directions.
21.3 Maintains good relations with customers and/or fellow workers.
21.4 Stays cheerful and helpful.
21.5 Practices personal hygiene and neatness.
21.6 Is punctual.
21.7 Observes all safety rules and regulations.
21.8 Identifies and follows company policies.

22.0 DEMONSTRATES LEADERSHIP SKILLS.
22.1 Organizes and leads a committee.
22.2 Leads and/or participates in a group discussion.
22.3 Prepares and presents a five minute speech.

23.0 APPLIES FOR A JOB.
23.1 Develops a personal resume.
23.2 Interviews for a job.

1.0 **COMPETENCY/SKILL:** Describes basic principles of plant growth and development.

1.1 **TASK:** Identifies plant parts and their functions.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an unlabeled diagram of a plant,

EVALUATION: identifies plant parts and their functions.

STANDARD: Diagram will be correctly labeled and functions will include reference to role in photosythesis; absorbtion and movement of water and nutrients; and role in sexual reproduction.

STUDENT LEARNING EXPERIENCES:

1. Define roles of various plant parts and how they are interrelated.
2. Describe variety of forms plant parts can take including unusual leaf forms, bracts, roots of epiphytes, and others as available to become aware of diversity within basic plant structure.
3. Identify a variety of native, low-water requiring plants such as cacti and succulents, palo verde, and creosote: to become aware of how plant parts adapt to reflect growing conditions.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present a variety of potted, canned, or bare root material for examination and identification of structures and forms.
2. Conduct a field walk in the immediate vicinity, identifying plant parts and relationships in landscape and/or native material.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Diagram of basic plant parts.
2. Assortment of living plant material.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit C, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 1, Vocational Instructional Services, College Station, TX., 1985.

1.0 **COMPETENCY/SKILL:** Describes basic principles of plant growth and development.

1.2 **TASK:** Describes the role of water, air, light and soil in plant growth and development.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given the conditions of plant development,

EVALUATION: describes the role of water, air, light, and soil in plant growth and development.

STANDARD: Description will accurately relate the function of water, air, light, and soil to the proper terminology describing plant growth processes.

STUDENT LEARNING EXPERIENCES:

1. Compare relative rates of transpiration by covering potted plants with clear plastic and placing them in various levels of temperature and light.

2. Demonstrate the process of osmosis by adding water to a water stressed plant.

3. List the five values of water to a plant.

4. List the processes of photosynthesis and respiration and explain how respiration is the reverse of photosyntheses.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review text on photosynthesis, absorbtion, osmosis, respiration, transpiration, digestion, assimilation, and storage.
2. Demonstrate the effect of soil composition on growth by potting identical seedlings in compacted soil and in a loose, friable medium.
3. Discuss area specific adaptations to low water, high heat environment as shown in palo verdes, mesquites, cacti, and succulents.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Variety of small potted plants, water, plastic bags, and growing media.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit E, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 4, Vocational Instructional Services, College Station, TX., 1985.

1.0 **COMPETENCY/SKILL:** Describes basic principles of plant growth and development.

1.3 **TASK:** Describes asexual plant production.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an explanation of how plants can be propagated from living tissue,

EVALUATION: describes asexual plant reproduction.

STANDARD: Description will include a listing of parts of plants and methods which can be used in asexual propagation.

STUDENT LEARNING EXPERIENCES:

1. Identify plant parts most commonly used in asexual propagation.
2. Identify the environmental factors which affect asexual propagation.
3. Describe the commercial benefits of asexual propagation.
4. Visit, as practical and seasonally appropriate, a citrus orchard or commercial rose range during the grafting/budding season.

1. Review text information relating to asexual propagation of plant materials.
2. Discuss the use of growth regulators in asexual reproduction from cuttings.
3. Discuss area specific crops dependent on asexual reproduction such as citrus, roses, and grapes.
4. Discuss the nature of tissue culture for asexual propagation, its current usage and benefits to the nursery trade.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Samples of rooted cuttings, grafted plant material, and vegetative plant parts used in asexual propagation.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit D, 2, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 6, Vocational Instructional Services, College Station, TX., 1985.

1.0 **COMPETENCY/SKILL:** Describes basic principles of plant growth and development.

1.4 **TASK:** Describe sexual plant reproduction.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a diagram of stylized flower,

EVALUATION: describes sexual plant reproduction.

STANDARD: Description will include accurate labeling of flower parts and their relationship to sexual plant reproduction.

STUDENT LEARNING EXPERIENCES:

1. Dissect and identify the parts of a flower.
2. Compare the role of environmental factors in seed formation and seed germination in the field and in the greenhouse/nursery environment.
3. Compare the difference between open or field pollination, cross pollination, self pollination, and closed pollination for seed hybridization.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review text materials relating to seed formation.
2. Discuss area specific crops dependent upon insect pollination (citrus), wind propagation (sorgum) and hybridization (vegetables), for their commercial importance.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Diagram of representative flower parts.
2. Razor blades for dissection of flowers.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit D, 1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 6, Vocational Instructional Services, College Station, TX., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, grows, and maintains nursery stock.

2.1 **TASK:** Identifies and describes various types of soil conditioning materials and their effects on soil characteristics.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given samples of soil conditioners commonly used in container growing,

EVALUATION: identifies and describes various types of soil conditioners and notes their effect on soil characteristics.

STANDARD: Materials are to be correctly identified and classified by their ability to modify drainage, provide moisture retention, and adjust the pH of the growing medium.

STUDENT LEARNING EXPERIENCES:

1. Calculate cost per yard of growing medium from a price list and formula of selected soil conditioners.
2. Identify other soil conditioners which might by locally available.
3. Measure the pH level of a soil mix with a pH test kit.
4. Adjust the pH level of a soil mix to a desired level by adding soil conditioners.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Explain the acid and alkaline concept and the soil pH relationship to plant nutrition.
2. Demonstrate the pH testing procedure of a specific system (electric pH meter, colorimetric test, etc.) according to the instructions for use with a particular system.
3. Discuss factors of cost and availability as they relate to local common choices of soil ammendments.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Samples of soil ammending materials including peat moss, perlite, vermiculite, sawdust, ground bark, lime, gypsum, et al.
2. pH test kit or pH meter.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit I, 1-7, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 4, Vocational Instructional Services, College Station, TX., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, grows, and maintains nursery stock.

2.2 **TASK:** Prepares proper soil mixtures for nursery stock.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given soil and selected conditioners, a wheelbarrow, containers of known volume, and a soil mix formula,

EVALUATION: prepares a proper soil mixture.

STANDARD: Materials must be added to the mixing through or wheelbarrow accurately by volume; fertilizer or pH ammending materials must be added properly by weight, and the soil mixed uniformly so that random samples taken from any spot in the mix reflect the same charactieristics.

STUDENT LEARNING EXPERIENCES:

1. Identify soil texture factors, factors affecting pH and fertility, and the reasons for preparing amended soil.
2. Measure ingredients accurately by volume or weight and mix by hand.
3. Compare methods of soil sterilization by steaming or use of chemicals, and identify benefits of sterilization.
4. Identify, over time, the effect of different soil mixes on container grown plants in otherwise identical conditions.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the basic mathematical concepts necessary to measuring materials in cubic feet/cubic yards.

2. Demonstrate the effect of different mixes and components on drainage.

3. Demonstrate, as applicable, proper soil sterilization techniques and discuss the commercial advantages of sterile media.

4. If seasonally applicable, experiment to see whether the sun can be used to raise soil temperatures to 180 degrees by covering a volume of soil with plastic, letting it bake in the sun, and measuring temperature with a soil thermometer.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Soil and soil amendments.

2. Wheelbarrows, shovels, containers, scale, hoe.

3. 4x8 clear plastic film, soil thermometer.

4. pH test kit or meter.

RESOURCES:

HORTICULTURAL ORPERATIONS STUDENT MATERIALS, CAT #31A, Unit I, 1-7, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 4, Vocational Instructional Services, College Station, TX., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, grows, and maintains nursery stock.

2.3 **TASK:** Propagates plants from cuttings.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given stock plants with suitable soft and semi-hard wood cutting material, rooting hormone, rooting media, knife, containers,

EVALUATION: propagates plants from cuttings.

STANDARD: Cuttings to be taken from healthy stock, at a length appropriate to the material, with a clean cut made at a 45% angle not crushing or breaking the plant material, then stripped and placed in prepared rooting containers.

STUDENT LEARNING EXPERIENCES:

1. Identify types of cuttings as to terminal, leaf, softwood, semi-hard, or hard.

2. Select and mix rooting medium; sterilize, fill and water rooting containers.

3. Use a pruning knife or small shears to take cuttings without crushing or breaking the plant material.

4. Strip cuttings, dip them in rooting hormone, place them in a rooting tray in a manner which is space efficient, yet permits some circulation of air.

5. Identify, prepare and apply proper fungicidal drench to rooting trays according to manufacturers instructions.

6. Compare and identify the effects of environmental factors on rooting and growth by placing some cuttings under automatic mist, some under a plastic tent with supplemental hand misting, and some in open air with supplemental hand misting.

7. Compare and identify the effects of supplemental fungicides in treated and untreated cutting trays.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the reasons for propagation from cuttings and relate its importance in locally produced greenhouse and nursery crops such as geraniums, poinsettias, hibiscus, lantana, bougainvilleas.
2. Describe the advantage of mist and fog propagation as they relate to speed and uniformity of production.
3. Identify and operate the components of a mist system including timers, solenoid valves, and the specifics of a given system.
4. Demonstrate the proper mixing and agitation of wettable powders.

INSTURCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Stock plants, knives, rooting hormone, fungicides, rooting media, trays.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit D, 3, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 6, Vocational Instructional Services, College Station, TX., 1985.

THE BALL REDBOOK, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, OH., 1985.

2.0 **COMPETENCY/SKILL:** Progagates, grows, and maintains nursery stock.

2.4 **TASK:** Selects quality seed.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a commercial seed catalog, a seed order form, and a growing program requiring 60,000 annual flowering seedlings in 20 varieties,

EVALUATION: selects quality seed.

STANDARD: Order form to be correctly filled out; selections to reflect fitness for local growing conditions, fitness for market, and reflect appropriate quantites.

STUDENT LEARNING EXPERIENCES:

1. Visit a local nursery to determine which seed grown annuals are being offered in the current market, and in what proportion to each other do they seem to be grown.
2. Compare possible varieties of seed for customer acceptance and economy of production.
3. Interpret a seed analysis tag commonly attached to packaged grass seeds.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Assess factors affecting viability of seed and the meaning of a seed analysis tag.
2. Assess environmental factors relating to selection of appropriate seed for a given climate and market season.
3. Relate the value of pelletized seed to contemporary use of automatic seeders.
4. Demonstrate acid scarification of locally important nursery crop seed such as "Mexican Bird of Paradise".

INSTURCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Commercial seed catalogs.
2. Seed analysis tags.

RESOURCES:

2.0 **COMPETENCY/SKILL:** Propagates, grows, and maintains nursery stock.

2.5 **TASK:** Propagates plants from seed.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given seeds to be planted and the necessary supplies,

EVALUATION: propagates plants from seeds.

STANDARD: The seeds must be planted at the recommended depth and spaced to permit both economical use for the germination area and still permit room for healthy initial growth.

STUDENT LEARNING EXPERIENCES:

1. Fill flats with germinating medium.
2. Water flats manually, mark them off in rows, sow seed by hand or with vibra-seeder, and cover to proper depth.
3. Mix and apply appropriate fungicide according to manufacturers instructions.
4. Determine environmental requirements for optimal germination from seed catalog information and place flats in most appropriate locations.
5. Compare the effects of soil fungicides by isolating and observing a non-treated flat.

29

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate effective ways of hand sowing fine seeds.
2. Review the most common seedling diseases and the role of fungicides.
3. Review the current use of automatic seeders to sow seeds to either germinating flats (plug trays) or final growing containers, (bedding plant packs).
4. Discuss the commercial production of nursery stock from seed in Arizona, particularly of native and adapted trees and shrubs.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Seeds, flats, germinating media, Chlorox, fungicides.
2. Clear plastic, black plastic, labels, waterproof marker, mist system.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit D, 1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 6, Vocational Instructional Services, College Station, TX., 1985.

THE BALL REDBOOK, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, OH., 1985.

2.0 **COMPETENCY/SKILL:** Progagates, grows, and maintains nursery stock.

2.6 **TASK:** Transplants rooted cuttings and/or seedlings with 90% survival.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given rooted cuttings or seedings in flats, appropriate media and containers for transplanting,

EVALUATION: transplants rooted cuttings or seedlings with 90% survival.

STANDARD: Cuttings and seedlings should be removed from trays and planted in containers without damaging the cutting or the root system, and containers should be filled uniformly.

STUDENT LEARNING EXPERIENCES:

1. Remove cuttings and seedlings from a tray without damaging them.
2. Plant cuttings or seedlings at proper level in containers without damaging them.
3. Hand water newly transplanted cuttings or seedlings without burying them or washing them out of the pot.
4. Evalate potential economics of automatic seeding equipment.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate transplanting seedlings and cuttings.
2. Demonstrate how to water-in freshly transplanted material.
3. Identify newer techniques of planting seedlings from plugs and transplating cuttings into pre-drilled holes prepared by a potting machine.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Rooted cuttings and/or seedlings; growing media, containers, watering devices.
2. Trade literature describing automatic seeding and transplanting devices.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit L, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURAL, CAT #115C, Unit G, 6, Vocational Instructional Services, College Station, TX., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, grows, and maintains nursery stock.

2.7 **TASK:** Waters containerized plants for optimum growth.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an area of greenhouse or nursery containerized plants,

EVALUATION: waters containerized plants for optimum growth.

STANDARD: Water will be applied at a time efficient volume which does not distrub the soil or the plants, until the soil is soaked and water drains through the containers.

STUDENT LEARNING EXPERIENCES:

1. List ways of determining when plants need to be watered.
2. Hand water nursery stock, seedlings, and flowering potted plants as available with various appropriate breakers.
3. Drain and store hoses and watering equipment.
4. Compare the relationships between frequent watering of container grown plants, fertility levels, build up of soluble salts, and optimum plant growth.
5. Estimate the benefits of an automatic watering system.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Analyze the effects of improper watering techniques.
2. Operate automatic watering systems as available, including programming of time clocks.
3. Review the relationship between water pressure, volume, and the determination of how many emitters or spray heads can be operated on a given time.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Water hoses.
2. Various water breakers and mist nozzles.
3. Components of an automatic watering system.

RESOURCES:

HORTICUTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Units E, 1-2, and K, 2, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 7, Vocational Instructional Services, College Station, TX., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, maintains, and grows nursery stock.

2.8 **TASK:** Selects and applies appropriate plant growth regulators to increase plant marketability.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given choices of commercial plant growth regulators, a suitable sprayer, and a specific crop to be treated,

EVALUATION: selects and applies appropriate growth regulator.

STANDARD: Proper regulator for specific crop is correctly identified, mixed to the correct concentration, and uniformly sprayed over the leaf surfaces of the plant.

STUDENT LEARNING EXPERIENCES:

1. Select proper growth regulator for the crop to be sprayed according to manufacurers recommendations.
2. Mix proper amount of growth regulator with given volume of water in spray tank.
3. Apply spray uniformly to plants while observing recommended safety precautions.
4. Clean and stores spray equipment and chemical containers.
5. Compare the effects of the growth regulator over time by observing an untreated plant with the treated crop.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the effects of growth regulating chemicals such as A-Rest, B-Nine, Cycocel and ancymidol and analyze why treated plants are move valuable in the marketplace.

2. Demonstrate the effects of too concentrated a spray, or too heavy a spray on a test plant.

3. Analyze possible consequences from use of other chemicals in a sprayer used for growth regulators.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Hand sprayer, assorted growth retardants.

2. Gloves and protective clothing as required.

3. Responsive potted plant crop, i.e. seed geraniums, mums, poinsettias, as seasonally approptiate.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit L, 1, 23, Vocational Instructional Services, College Station, TX., 1985.

THE BALL REDBOOK, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, OH., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, grows, and maintains nursery stock.

2.9 **TASK:** Manipulates environmental conditions for optimum plant growth.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an appropriate closed environment (greenhouse) with ability to regulate temperature, light, day length, and air circulation,

EVALUATION: manipulates environmental conditions to promote optimum plant growth.

STANDARD: Selections of environmental modifications will include crop specific minimum night and maxiumum day temperatures, shading, altering day length by lights or black cloth, and providing for the introduction and exchange of fresh air.

STUDENT LEARNING EXPERIENCES:

1. Determine proper light levels, temperatures, and day lengths for a given crop from a seed guide or crop reference manual.
2. Program greenhouse computer or mechanical controls to regulate temperature through heaters and fans.
3. Install shade cloth, draw black cloth, or program lights to regulate light intensity and day length.
4. Record the effects of improper environmental conditions on selected plants grown outside the program.
5. List proper safety precautions required in the installation and operation of greenhouse heating and cooling equipment.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the concept of photoperiodicity in flowering plants.
2. Examine environmental factors which affect crop timing, and in selected instances, can render seasonal crops unmarketable.
3. Demonstrate the proper sequence of setting environmental controls.
4. Identify and demonstrate safety features in the installation and operation of environmental controls.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Greenhouse where environmental conditions can be manipulated.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit K, Vocational Instructional Services, College Station, TX., 1985.

THE BALL REDBOOK, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, OH., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, grows, and maintains nursery stock.

2.10 **TASK:** Select appropriate plant containers.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a listing of commercially produced greenhouse and nursery crops,

EVALUATION: selects appropriate containers.

STANDARD: Plant material as listed is matched to containers with consideration of size of plant, market custom, ease of handling, and economy.

STUDENT LEARNING EXPERIENCES:

1. Visit a local nursery or garden center and determine what types of plants are being grown in what types of containers.
2. Compare relative costs of possible contaienrs through familiarization with nursery supply catalogs.
3. Isolate relative advantages of different types of container material, i.e., plastic, clay, and paper.
4. Identify containers which lend themselves most readily to automated filling and planting equipment.

39

SUGGESTEED INSTRUCTIONAL TECHNIQUES:

1. Appraise the relative merits of various shapes of container materials as they relate to return per square foot of growing area.
2. Identify the need for various levels of appearance and/or durabality of containers as they relate to length or crop time, consumer acceptance, shipping problems, etc.
3. Assess the advantages of sterilizing used containers before reuse.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Assortment of commonly used containers and flats.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit E, 2, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 7, Vocational Instructional Services, College Station, TX., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, maintains, and grows nursery stock.

2.11 **TASK:** Identifies and safely controls weeds in and around the greenhouse.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a selection of potted plants or section of growing bed and appropriate tools,

EVALUATION: identifies and safely controls weeds in and around the greenhouse.

STANDARD: All visible weeds must be removed from a given area in a given time without damaging the crop.

STUDENT LEARNING EXPERIENCES:

1. Identify types of weeds which appear in potted plants or growing beds.
2. Remove weeds with appropriate tools.
3. Select and apply pre-emergent weed control chemicals to bench crops or nursery containers according to manufacturers' instructions.
4. Select and apply pre and post emergent weed controls outside the greenhouse.
5. Clean and store equipment used to apply chemical controls.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review characteristics and kinds of weeds commonly found in the greenhouse environment.

2. Identify and examine weeds in various stages of growth in the greenhouse.

3. Demonstrate removal of weeds from containers or beds.

4. Discuss practical selection and application of herbicides in and around the greenhouse.

5. Review safety precautions necessary in mixing and application of chemicals, both from the operator's point of view, and to prevent damage to crops.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Hoe, cultivator, or other hand tools for removal of weeds; containers for cleanup and disposal.

2. Selection of pre and post emergent herbicides commonly used in and around the greenhouse: Surflan, Ronstar, Roundup, Poast, et. al.

3. Pump type sprayer for application of herbicides.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit H, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 2, 3, Vocational Instructional Services, College Station, TX., 1985.

THE NEW PESTICIDE USERS GUIDE, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, OH., 1985.

APPLY PESTICIDES CORRECTLY, USDA/EPA bulletin in ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

2.0 **COMPETENCY/SKILL:** Propagates, maintains, and grows nursery stock.

2.12 **TASK:** Identifies and safely controls insects in and around the greenhouse.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a selection of potted plants or section of growing bed, appropriate chemical controls and applicator,

EVALUATION: identifies and safely controls insects in and around the greenhouse.

STANDARD: Common insects will be identified correctly, controls will be mixed accurately according to manufacturers' recommendations and applied uniformly following all safety precautions.

STUDENT LEARNING EXPERIENCES:

1. Identify greenhouse and nursery insect pests.
2. Identify and use protective clothing and respirators as required during insecticide applications.
3. List possible consequences of insecticide poisoning.
4. List and demonstrate immediate actions to be taken if insecticide poisoning is suspected.
5. Select proper insecticide for pest to be controlled and appropriateness for specific crop.
6. Mix and apply liquid insecticides at proper rates while observing all safety precautions.
7. Apply granular insecticides at proper rate per container or growing area size while observing all safety precautions, clean and store equipment.
8. Design a preventative insect control program.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Identify most common greenhouse insects and review their life cycles.
2. Analyze the lethal dose concept as it relates to operator risk.
3. Describe current use of insecticide "foggers" in the trade, and their operator hazards.
4. Review proper cleaning and storage of containers and equipment, and proper disposal of chemicals and containers.
5. Identify Federal/State regulations governing purchase use, and disposal of insecticides.
6. Identify and demonstrate the use of protective clothing and respirators.
7. Dramatize the immediate actions to be taken in the event of insecticide poisoning.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Spray equipment and dry chemical applicators used to apply insecticides.
2. Protective clothing and gas mask.
3. Emergency first aid kit including atropine syrettes.
4. Proper storage and disposal facilities for chemical containers.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit H, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 2-3, Vocational Instructional Services, College Station, TX., 1985.

THE NEW PESTICIDE USERS GUIDE, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, OH., 1985.

APPLY PESTICIDES CORRECTLY, USDA/EPA bulletin in ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

2.0 **COMPETENCY/SKILL:** Propagates, maintains, and grows nursery stock.

2.13 **TASK:** Identifies and safely controls diseases in and around the greenhouse.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a selection of potted plants or section of growing bed, approrpriate chemical controls and applicator,

EVALUATION: identifies and safely controls diseases in and around the greenhouse.

STANDARD: Common diseases of greenhouse and nursery stock will be correctly identified; chemical controls will be mixed accurately according to manufacturer's recommendations, and all incidental debris will be removed from area of responsibility.

STUDENT LEARNING EXPERIENCES:

1. Identify common diseases of ornamental crops.
2. List enviromental factors which contribute to plant disease.
3. Clean greenhouse growing areas and beds, removing all incidental plant trash and debris.
4. Identify greenhouse crops prone to diseases and list appropriate chemical controls.
5. Design a preventative disease control program, estimating costs and benefits.
6. Mix and apply chemical disease controls accoridng to manufacturer's recommendations.
7. Clean and store tools, equipment, and chemicals.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review concept of greenhouse sanitation and proper use of environmental controls as primary disease preventatives.
2. Analyze seasonal effects on predictability and seriousness of disease problems.
3. Identify as available greenhouse material showing symptoms of disease.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Rakes, brooms, and containers for the collection of greenhouse debris.
2. Assorted fungicides for the prevention or cure of plant diseases and appropriate applicators.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit H, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 2-3, Vocational Instructional Services, College Station, TX., 1985.

THE NEW PESTICIDE USERS GUIDE, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State Universtiy, Columbus, OH., 1985.

APPLY PESTICIDES CORRECTLY, USDA/EPA bulletin in ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

2.14 **TASK:** Protects plants in outdoor growing areas from environmental extremes such as frost, direct sunlight, high winds, etc.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given appropriate structures and/or materials,

EVALUATION: protects plants in outdoor growing areas from damage by environmental extremes.

STANDARD: Nursery or flower crops are sufficiently protected from environmental extremes so that they live and meet market standards.

STUDENT LEARNING EXPERIENCES:

1. Identify commercially important nursery crops which require protection from environmental extremes.
2. Compare types of structures and covering materials on a cost per square foot basis.
3. Erect or cover existing shade or cold frame structures as seasonally appropriate.
4. Cover frost sensitive material with frost blankets as seasonally necessary.
5. Identify plant material which might be suitable for a windbreak.
6. Design a small nursery layout with provision for protection from environmental extremes.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss various structural materials used in building and covering shade houses and cold frames.
2. Demonstrate proper techniques for building or covering existing structures.
3. Review the effects of environmental factors on plant growth.
4. Evaluate the probable consequences of crops grown in too favorable an artificial environment.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Shade structure and cold frame covering material.
2. Shade structures and cold frame.
3. Construction materials and tools as appropriate to erect a protective structure.
4. Frost blankets.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit G, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 3, Vocational Instructional Services, College Station, TX., 1985.

2.0 **COMPETENCY/SKILL:** Propagates, maintains, and grows nursery stock.

2.15 **TASK:** Transplant (shift) containerized plants into larger containers without unnecessary plant injury.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given smaller containerized plants, potting soil, and larger containers,

EVALUATION: shifts plants into larger containers without unnecessary plant injury.

STANDARD: Plants are shifted and repotted without visible damage to rootball or structure, and planted at correct height in new container with a 100% survival rate.

STUDENT LEARNING EXPERIENCES:

1. Identify appropriate size container needed for shift.
2. Partially fill larger container with potting soil.
3. Remove small plant from container, set at correct level in new container, fill larger container with soil, water in.
4. Move shifted plants to growing location.

SUGGESTED INSTRUCTIONAL TECHINQUES:

1. Demonstrate proper manner of removing plants from containers.
2. Review proper watering practices.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Containerized plants ready to be shifted up.
2. Larger containers, potting soil, water breakers.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit E, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 7, Vocational Instructional Services, College Station, TX., 1985.

3.0 COMPETENCY/SKILL: Mixes and applies horticultural chemicals.

3.1 TASK: Interprets a fertilizer analysis.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a commercial fertilizer label,

EVALUATION: interprets a fertilizer analysis.

STANDARD: Interpretation correctly identifies the components of the fertilizer including minor nutrients or trace elements if listed.

STUDENT LEARNING EXPERIENCES:

1. List and describe functions of major fertilizer components.
2. Identify commonly used fertilizer components from their analysis.
3. Compare various forms of fertilizers including liquid, granular, slow release, readily soluble, and organic, and cite the relative merits of each.
4. Interpret a soil test report to determine fertilizer requirements.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review functions of major fertilizer components and the role of trace elements.
2. Demonstrate the use of soil test reports to determine fertilizer requirements.
3. Discuss the ppm concept as it relates to constant liquid feed of greenhouse and nursery crops.
4. Demonstrate, as available, the use of a Smith type injector or proportioner.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Assorted fertilizer analyses.
2. Samples of fertilizers in different forms.
3. Soil test report.
4. Injector or proportioner.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 37-40, Arizona Nursery Assocaition, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit I, 6, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 4, Vocational Instructional Services, College Station, TX., 1985.

THE BALL REDBOOK, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Services, The Ohio State University, Columbus, OH., 1985.

3.0 **COMPETENCY/SKILL:** Mixes and applies horticultural chemicals.

3.2 **TASK:** Determines the amount of chemical required for a certain size area.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an application ratio for a chemical,

EVALUATION: determines the amount of chemical required for a certain size area.

STANDARD: The amount of chemical selected for the area will be accurate for the size of the area to be covered.

STUDENT LEARNING EXPERIENCES:

1. Convert a fertilizer application ratio expressed in pounds of nitrogen per 1000 square feet to the correct number of pounds of a given fertilizer needed to cover 10,000 square feet.
2. Convert an herbicide application ratio expressed in ounces of herbicide per gallons of water to treat an acre to the correct number of ounces of herbicide per gallons of water to treat 5,000 square feet.
3. Convert a fertilizer application ratio expressed in ounces per container to the correct number of pounds of fertilizer needed for 5,000 containers.
4. Convert a fertilizer application ratio expressed in PPM to the correct number of pounds of fertilizer to be dissolved in 50 gallons of water for feeding through an injector at a rate of 1:500.
5. Identify the consequences of appling fertilizers, insecticides, and herbicides at too great or too low a rate.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the mathematics required to manipulate ratios.
2. Discuss economic and environmental consequences of improper chemical application.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Manufacturers suggested application rates for assorted granular, liquid, and water soluble chemicals.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 37-40, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit I, 6, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 4, Vocational Instructional Services, College Station, TX., 1985.

THE BALL REDBOOK, Prentice Hall, Englewood Cliffs, NJ., through Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Columbus, OH., 1985.

3.0 **COMPETENCY/SKILL:** Mixes and applies horticultural chemicals.

3.3 **TASK:** Operates application equipment such as pump sprayers, hose-end sprayers, drop spreaders, and cyclone spreaders safely.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given commonly used hand application equipment and a designated area,

EVALUATION: operates application equipment such as pump sprayers, hose-end sprayers, drop spreaders, and cyclone spreaders safely.

STANDARD: Equipment to be properly calibrated, filled without spillage; operated without damage to operator, environment, or equipment; and designated area will be covered uniformly.

STUDENT LEARNING EXPERIENCES:

1. Identify environmental factors which affect proper use of hand application equipment.
2. Measure liquid chemical, fill and charge pump sprayer, and apply chemical to designated area.
3. Attach hose end sprayer to hose, measure liquid chemical, fill spray jar, attach to sprayer and apply chemical to designated area.
4. Operate cyclone or drop spreader mechanisms prior to filling. Clean and lubricate as necessary.
5. Calibrate cyclone or drop spreader to dispense selected chemical per manufacturer's recommendations.
6. Fill and operate cyclone or drop spreader providing uniform distribution of chemical.
7. Water in chemicals as necessary.
8. Clean and store equipment.
9. Compare relative merits of associated types of applicators: drop/cyclone spreaders; hose-end/pump type sprayers.

SUGGESTED INSTRUCTIONSL TECHNIQUES:

1. Demonstrate calibration and use of hand application equipment.
2. Review environmental factors such as min/max temperatures, wind, water, and season which affect performance and safe use of commonly applied chemicals.
3. Discuss practical methods to prevent or clean up after damage from spills.
4. Discuss proper disposal of "left over" chemicals.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Commonly used spreaders, sprayers, and chemicals to be applied.
2. Hand tools as necessary to calibrate or adjust equipment.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit H, 3, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 1-2, Vocational Instructional Services, College Station, TX., 1985.

3.0 **COMPETENCY/SKILL:** Mixes and applies horticultural chemicals.

3.4 **TASK:** Handles, mixes, applies, and disposes of chemicals according to label directions.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a selection of liquid, granular, and soluble horticultural chemicals,

EVALUATION: handles, mixes, applies, and disposes of chemicals according to label directions.

STANDARD: Use of any given chemical will be in accordance with label directions.

STUDENT LEARNING EXPERIENCES:

1. Locate and list warnings, precautionary statements, statement of practical treatment and antidote, directions for use and directions for storage on chemical labels.
2. Identify the three basic ways in which poisons may enter the body and list proper precautions.
3. Identify the basic protective clothing to be worn when handling horticultural chemicals.
4. Compare uses of different types of respirators.
5. List the symptoms of mild, moderate, and severe pesticide poisonings and identify first aid procedures.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the ascending scale of cautionary statements on labels.
2. Demonstrate the proper use of protective clothing and respirators.
3. Review proper first aid procedures including the basics of mouth to mouth resuscitiation, and locate point out the location of emergency numbers in the greenhouse or nursery.
4. Point out proper storage areas for horticultural chemicals and discuss potential hazards of improper storage given the temperature extremes of Arizona summers.
5. Review fire safety precautions and the location and use of fire control equipment in the greenhouse and nursery.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Labels and labeled chemical containers.
2. Protective clothing and respirators.
3. Fire safety equipment.
4. First aid traing materials.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit H, 3, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 1-2, Vocational Instructional Services, College Station, TX., 1985.

3.0 **COMPETENCY/SKILL:** Mixes and applies horticultural chemicals.

3.5 **TASK:** Identifies federal, state, and local regulations governing the use and disposal of horticultural chemicals.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a variety of horticultural chemicals,

EVALUATION: identifies federal, state, and local regulations governing use and disposal.

STANDARD: Identification will include EPA registration and classification; state law governing applicator certification; and federal/state law governing disposal.

STUDENT LEARNING EXPERIENCES:

1. Cite the federal, state, and local agencies which govern the use of horticultural chemical applications.
2. Define the classifications of Private Applicator, Commercial Applicator, and Non-commercial Applicator as they relate to use of federal or state restricted chemicals.
3. List state requirements for a Commercial Applicators license.
4. Identify federal and state regulations governing the disposal of horticultural chemicals.
5. List federal, state, and local penalties which can be imposed for improper use of chemicals, or for use by improperly licensed applicators.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Analyze the responsiblity of federal and state agencies governing the use of, primarily, pesticides.
2. Discuss probable environmental and health hazards of improper use.
3. Discuss the potential toxicity of even "safer" pesticides when mishandled, to the environment, the applicator, and, as in the tragedy at Bhopal, India, the community at large.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Summary of federal, state, and local regulations governing use and disposal of chemicals.
2. Summary of federal, state, and local regulations governing certification of applicators.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit H, 3, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 1-2, Vocational Instructional Services, College Station, TX., 1985.

4.0 **COMPETENCY/SKILL:** Drafts landscape and irrigation plans.

4.1 **TASK:** Identifies drafting equipment by name and function.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given assorted materials used in drafting landscape and irrigation designs,

EVALUATION: identifies drafting equipment by name and function.

STANDARD: Equipment is properly identified and function described.

STUDENT LEARNING EXPERIENCES:

1. Identify and describe the use of a T square and triangle.
2. Identify and describe the use of a scaled drafting machine.
3. Describe the characteristics of drafting tape.
4. Identify the uses of an architectural scale.
5. Identify and describe the uses of landscape templates.
6. Identify and describe the uses of french curves and adjustable curves.
7. Identify and discriminate between the uses mechanical pencils, leads, and drafting pens used in preparing a landscape design.
8. Describe the use of Letraset, Chartpak, and other transfer type symbols in preparing a landscape design.
9. Identify and discriminate between the uses and types of paper used in landscape and irrigation design.
10. Identify types of colors, washes, and texture indicating materials associated with finishing a landscape design.
11. Identify the uses of LeRoy and Kroy lettering systems as they relate to landscape design presentation.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate setting up a drafting table or CAD center for the production of landscape/irrigation designs.

2. Demonstrate proper cleaning and care of drafting pens.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Drafting materials and equipment commonly used in the preparation of landscape and irrigation designs.

2. Samples of drafting aides including rubber stamps, transfer symbols, colors, etc.

3. CAD system.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 3, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 8, Vocational Instructional Services, College Station, TX., 1985.

4.0 **COMPETENCY/SKILL:** Drafts landscape and irrigation plans.

4.2 **TASK:** Draws landscape and irrigation plans to scale.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a sketch with accurate dimensions and location of features to be installed,

EVALUATION: draws landscape and irrigation plans to scale.

STANDARD: Landscape plant material will be accurately located and drawn to mature scale; hardscape features will be drawn to scale; and irrigation lines and features will be drawn in appropriate locations.

STUDENT LEARNING EXPERIENCES:

1. Use drafting equipment and an architect's scale to lay out a site plan and locate existing structures on Clearprint type paper.
2. Use a tissue overlay to rough in landscape features.
3. Use a French curve or adjustable curve to design sod and shrub areas with irregular borders.
4. Use a T square and triangle to lay out regular features and borders.
5. Use a circle template or protractor to indicate mature size of shrubs and trees.
6. Prepare a finished pencil drawing of a landscape plan on Clearprint type paper.
7. Trace a scale site plan with situated landscape features and lay out irrigation pipelines.
8. Locate irrigation features including sprinkler heads, valve boxes, tap, and timing device location on an irrigation plan.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the use of tissue overlays or roughs as a way to "play" with landscaping ideas and forms prior to "commiting" them to paper.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Drafting equipment and materials commonly used in the production of landscape and irrigation designs.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 3, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 8, Vocational Instructional Services, College Station, TX., 1985.

4.0 **COMPETENCY/SKILL:** Drafts landscape and irrigation plans.

4.3 **TASK:** Prepares plans for blueprinting and presentation.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape and/or irrigation plan drawn to scale,

EVALUATION: prepares plans for blueprinting and presentation.

STANDARD: Plans will be accurately labeled, contain appropriate landscape/irrigation symbols, indicate textures and complements, and be clear in presentation for homeowner and installation crew.

STUDENT LEARNING EXPERIENCES:

1. Use drafting pens or pencils of varying widths to ink in or finalize site plan and existing features.
2. Draw conventional symbols to indicate plant material and texture or proposed complements.
3. Use transfer type architectural symbols to indicate plant material and texture of proposed complements.
4. Use solid, broken, and dotted lines to indicate pipe system for irrigation plan.
5. Use appropriate symbols to locate irrigation heads.
6. Label a landscape or irrigation plan by hand or using a LeRoy lettering kit.
7. Border a plan using chart tape.
8. Draft a front elevation of a landscape plan.
9. Blueprint landscape and irrigation plans.
10. Have a landscape plan printed in brown or sepia tone.
11. Use color to enhance a brown or blueprinted landscape plan.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the relationship of a professionally prepared plan to the landscape/irrigation sales process.
2. Discuss career opportunities in landscape/irrigation design.
3. Discuss alternative of CAD system in preparing a plan.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Drafting equipment, pens, pencils, transfer symbols, colors, chart tape.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 3, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 8, Vocational Instructional Services, College Station, TX., 1985.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.1 **TASK:** Determines available water pressure in pounds per square inch.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an existing water system and a water pressure gauge,

EVALUATION: determines available water pressure in pounds per square inch.

STANDARD: Pressure gauge will be attached to an outside faucet while no water is running in the system and the gauge will be read correctly.

STUDENT LEARNING EXPERIENCES:

1. Connect a water pressure guage to an outside faucet and record the water pressure as related in psi.
2. Call the city water department and request the water pressure for a given location.
3. Differentiate between static water pressure and working water pressure.
4. Calculate working water pressure from a static water presure.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the use of a water pressure gauge.
2. Review practical factors involved in determining a working water pressure.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Water pressure gauge.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902155, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.2 **TASK:** Determines available flow rate in gallons per minute.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an existing water system with a known static water pressure, access to the water meter and service line, and a conversion chart,

EVALUATION: determines available flow rate in gallons per minute.

STANDARD: Size of meter and service line will be accurately measured and flow rate will be accurately determined from chart.

STUDENT LEARNING EXPERIENCES:

1. Identify two ways to determine water meter size.
2. Locate and determine the size of the water meter.
3. Identify two ways to determine the size of a service line.
4. Determine the size of the service line.
5. Determine the flow rate from a chart listing meter size, service line size, and static water pressures.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review how static water pressure is determined.
2. Discuss difference in flow rates between copper and galvanized systems.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Existing water system.
2. Gpm converison chart.
3. String, ruler, and a circumference to diameter conversion table for copper and galvanized pipe.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902155, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.3 **TASK:** Uses drafting equipment to draw a plot plan to scale.

PERFORMANCE OBJECTIVE:

CONDITIONS:	Given an existing, landscaped site to measure, a tape measure, and necessary drafting equipment,
EVALUATION:	uses drafting equipment to draw a plot plan to scale.
STANDARD:	Plot plan will be drawn at a scale of 1-10; boundaries and all existing landscape features and structures will be located with an accuracy of +- 6".

STUDENT LEARNING EXPERIENCES:

1. Measure a given, landscaped site with a tape measure and make a rough sketch locating existing structures and landscape features.
2. Draw a 1-10 scale plot plan from an on-site sketch using drafting equipment and an architectural scale.
3. Locate existing structures and landscape features on the plan and label.
4. Locate water meter, service line, and electric service location on plan.
5. Indicate "North" on the plan.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the use of an architectural scale.
2. Demonstrate simple symbolic representations of landscape details.
3. Discuss practical reasons why, though the on-site sketch may be rough, the dimensions and locations of features need to be accurate and inclusive.
4. Present samples of plot plans suitable for use in drawing irrigation plans.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. 50 foot tape measure.
2. Architectural scales and drafting equipment.
3. Sample plot plans.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902155, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.4 **TASK:** Compares sprinkler, bubbler, and drip irrigation applications.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given the various needs of a landscape situation for irrigation delivery systems,

EVALUATION: compares sprinkler, bubbler, and drip irrigation applications.

STANDARD: Systems are compared with regard to appropriateness for intended task, economy of installation, economy of maintenance, and economy of operation.

STUDENT LEARNING EXPERIENCES:

1. Identify the advantages of a sprinkler, bubbler, or drip irrigation system over flood irrigation and/or hand watering in a landscaped environment.
2. Identify the nature and correct and practical used of pop-up lawn sprinklers and impact sprinklers.
3. Identify practical uses of a bubbler irrigation system.
4. Identify practical uses of drip/micro spray irrigation systems.
5. Compare the advantages and disadvantages of drip vs bubbler irrigation systems.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the various types of systems as they relate to the issue of water conservation in an arid environment.

2. Discuss newer concepts in landscape irrigation such as the use of micro spray heads in conjunction with drip irrigation; laser cut tubing for underground irrigation of shrub beds; and pre-determined flow rate bubbler heads.

3. Discuss the use of "hi-pop" heads for shrub irrigation.

4. Demonstrate the proper assembly of solenoid valve, Y strainer, and pressure reducing valve for drip irrigation systems.

5. Discuss factors relating to economy of installation and maintenance of various irrigation systems.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Assorted sprinkler heads, bubbler heads, and drip system components.

RESOURCES:

LANDSCAPING TO SAVE WATER IN THE DESERT, Johnson and Harbison, E&H Products, Rancho Mirage, CA., 1986.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902155, HP486200M, The Toro Company, Riverside, CA.

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales Inc., Turf Division, Glendora, CA., 1984.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.5 **TASK:** Reads and interprets sprinkler performance charts.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a known working water pressure and a sample sprinkler performance charts,

EVAULATION: Reads and interprets sprinkler performance charts.

STANDARD: The spray radius and flow rate of a given sprinkler is determined with 100% accuracy.

STUDENT LEARNING EXPERIENCES:

1. Define the term "flow" rate.
2. Identify the units used to measure water pressure and flow rates in sprinkler systems.
3. Determine the spray radius and flow rates of sprinkler heads from a sprinkler performance chart.
4. Identify the factors involved in determing the flow rate of a drip irrigation system.
5. List the maximum gph of all emitters on a single drip line; the maximum practical length of a 1/2" service line; and the maximum practical length of distribution tubing.
6. Identify the factors involved in determining the flow rate of a bubbler system.
7. Identify major manufacturers of landscape irrigation systems which are locally distributed.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the concept of manufacturer support, i.e. why it is most practical to install systems from manufacturers which provide strong documentation and ready distribution.

2. Review the different types of lawn irrigation heads available and their practical uses, including standard and low angle heads, impact heads, and rotary heads.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Sprinkler performance charts from manufacturers such as Toro and Rainbird.

2. Assorted sprinklers, emitters, and bubbler heads.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

74

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.6 **TASK:** Locates sprinkler/bubbler/drip devices on a plot plan with proper coverage and overlap.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a plot plan with landscape features in place,

EVALUATION: locates sprinkler/bubbler/drip devices on a plot plan with proper coverage and overlap.

STANDARD: Appropriate devices will be selected for the type of irrigation needed by the landscape features and placed so that no areas are underwatered and no areas are overwatered by a factor greater than 5%.

STUDENT LEARNING EXPERIENCES:

1. Identify the type of turf irrigation sprinklers selected for use on a given plot plan.
2. Measure turf areas on the plot plan with an architectural scale and locate appropriate sprinkler devices on the plan.
3. Use a propractor to indicate the actual area to be covered by each sprinkler head.
4. Identify landscape features to be watered with a bubbler system and locate bubblers on plan.
5. Identify landscape features to be watered with a drip system and locate on plan.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss trade meanings of the terms "coverage" and "overlap".
2. Review range of choices available in lawn irrigation componenst.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Plot plan with identified landscape features.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #49021[illegible]5, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.7 **TASK:** Selects appropriate sprinkler/bubbler/drip components.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a plot plan with landscape features in place and sprinkler/bubbler/drip locations determined, and manufacturers model numbers/parts lists,

EVALUATION: selects appropriate sprinkler/bubbler/drip components.

STANDARD: Components selected will meet the water needs of the landscape features, be labeled with trade recognized symbols, and be listed accurately by quantity, model number and/or part number with 100% accuracy.

STUDENT LEARNING EXPERIENCES:

1. Label turf sprinkler locations on plot plan with spray pattern symbols.
2. Select and list sprinkler components in a legend on plot plan.
3. Label bubbler locations with appropriate symbols on plot plan.
4. Select and list bubbler components in a legend on plot plan.
5. Label drip emitter locations by gph or appropriate symbols on plot plan.
6. Select and list emitter components in a legend on plot plan.
7. Identify the benefits of accuracy and uniformity in legends and symbols.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review commonly used irrigation symbols.
2. Demonstrate the construction of a sprinkler legend.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Sample labeled irrigation plan with legend.
2. Manufacturers model number and parts lists for sprinkler/bubbler/drip devices.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.8 **TASK:** Divides an irrigation system into appropriate circuits.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a plot plan with irrigation components located and identified, and working flow rate determined,

EVALUATION: divides an irrigation system into appropriate circuits.

STANDARD: The flow rate required by any given circuit does not exceed the available flow rate of the system and the flow rates of the circuits are balanced with respect to each other.

STUDENT LEARNING EXPERIENCES:

1. Calculate the water flow requirements of all turf irrigation heads on the plot plan to determine how many gpm the system requires to operate.

2. Divide the heads needed to irrigate the turf area into two or more circuits of relatively equal flow rates if the total gpm required is greater than the system can handle on one circuit.

3. Determine the gph requirements of drip emitters on the plan. If greater than 240 gph, divide into two or more balanced circuits.

79

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss pratical and environmental factors which influence division of heads into circuits.

2. Demonstrate a basic circuit layout of a lawn area.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Plot plan with irrigation components located and identified.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.9 **TASK:** Locates pressure anti-siphon device, control valves, and automatic timers on the plot plan.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a plot plan with water service line and electric service located, and irrigation components located and identified,

EVALUATION: locates pressure vacuum breakers, control valves and automatic times on plot plan.

STANDARD: Breakers will be placed on the plan in appropriate location with regard to water source; valves will be located with regard to accessibility and minimal wire run; timer will be located with regard to accessibility and minimal wire run.

STUDENT LEARNING EXPERIENCES:

1. Define the term "anti-siphon device".
2. Identify and compare types of anti-siphon devices.
3. Locate anti-siphon device on plot plan.
4. Describe the role and identify common types of control valves used in sprinkler systems.
5. Select proper size control valve for a given sprinkler operation.
6. Define the term valve manifold as it relates to sprinkler control valves.
7. Identify guidelines for locating control valves.
8. Locate control valves on plot plan.
9. Describe the common types of irrigation timers.
10. Identify the type of timer which best suits the needs of the plot plan.
11. Identify guidelines for locating timers.
12. Locate the timer on the plot plan.
13. Compare advantages and disadvantages of automatic and manual systems.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Disassemble and demonstrate the operation of anti-siphon devices.

2. Discuss the advantages and disadvantages of atmospheric and pressure vacuum breakers.

3. Disassemble and demonstrate the operation of common solenoid valves.

4. Review the common types of timers available, i.e., electro-mechanical, electronic, single program, dual program.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Commonly used breakers, valves, and automatic timers.

2. Manufacturers specification sheets detailing characteristics and typical use of breakers, valves and timers.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.10 **TASK:** Lays out system piping for maximum efficiency and minimum cost.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a plot plan with valves and sprikler components located and identified, and a chart listing flow rate capacities of PVC pipe,

EVALUATION: lays out system for maximum efficiency and minimum cost.

STANDARD: Pipe schedule and sizes selected will permit the system to operate at optimum flow rates; lengths of pipe runs will be minimum needed to service all irrigation components.

STUDENT LEARNING EXPERIENCES:

1. Classify PVC pipe by schedule.
2. Select the proper PVC pipe schedule for a given application.
3. Select the proper pipe size for a given flow rate.
4. Identify factors involved in efficient pipe layout.
5. Lay out system piping on plot plan for sprinklers.
6. Label the pipe sizes.
7. Lay out system piping on plan for bubblers.
8. Utilize the flexibiltiy inherent in drip system piping to lay out drip system.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the characteristics of PVC pipe.
2. Diagram a simple main-and-lateral installation showing how irregular areas are serviced.
3. Review the concept of flow rate as it relates to pipe sizes in terms of efficiency and economy.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. A chart listing flow rate capacities of PVC pipe.
2. Sample lengths of PVC pipe of different schedules.
3. Sample lengths of drip irrigation pipe and tube.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.11 **TASK:** Identifies irrigation fittings.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a completed irrigation plan,

EVALUATION: identifies irrigation fittings.

STANDARD: Fittings necessary to install the irrigation plan will be identified by quantity, size, shape, material and type of connection with 95% accuracy.

STUDENT LEARNING EXPERIENCES:

1. Differentiate between copper, galvanized, and PVC pipe and fittings.
2. Identify fittings by shape, function, and size.
3. Identify fittings by type of connection.
4. Assemble threaded PVC fittings using Teflon tape.
5. Visit an irrigation parts house and identify common and special use fittings.
6. List fittings necessary to complete a given irrigation plan by quantity, size, materials and connection type on a Bill of Materials.
7. Measure the lengths of various sizes of pipe needed to complete the irrigation plan with an architectural scale and list on a Bill of Materials.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review nomenclature of fittings.

2. Review proper format for designating pipe fittings.

3. Demonstrate proper assembly of components of sprinkler head set-ups, including swing joints and flexible pipe as appropriate.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Assorted PVC, Copper, and galvanized fittings.

2. Teflon tape.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

5.0 **COMPETENCY/SKILL:** Designs irrigation systems.

5.12 **TASK:** Prepares a materials cost summary.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a completed irrigation plan, Bill of Materials, and price reference sheets,

EVALUATION: prepares a materials cost summary.

STANDARD: Summary will identify by quantity, model, and proper nomenclature all components fo the irrigation system and indicate unit price, price per quantity required, and total price of all components.

STUDENT LEARNING EXPERIENCES:

1. Match irrigation components with description in price sheets and list name, quantity, cost @ and total cost on materials cost summary.
2. Determine costs of timers, valves, anti-siphon devices, pressure reducer, and Y strainer as/if specified and list name, quantity, cost @ and total cost on materials cost summary.
3. Price out, if not otherwise specified, "incidentals" such as PVC cement, primer, teflon tape, wire, solder, flux, and emery cloth.
4. Calculate the total materials cost of the irrigation plan.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the need for an accurate take off as it relates to accurate determination of costs.

2. Discuss the advantages and disadvantages of buying in quantity and maintaining an inventory vs. buying on an as need basis.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Parts supplier catalogs and price lists.

2. Completed irrigation plan with Bill of Materials.

RESOURCES:

ESTIMATING AND MANAGEMENT PRINCIPLES FOR LANDSCAPE CONTRACTORS, Charles Vander Kooi, California Landscape Contractors Association, Sacramento, CA., 1985.

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA., 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.1 **TASK:** Taps into the existing service line.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given proper tools and materials and an actual or stimulated irrigation system to install,

EVALUATION: taps into the existing service line.

STANDARD: Appropiated size and type fittings are selected and the tap does not leak when the system is pressurized.

STUDENT LEARNING EXPERIENCES:

1. Identify the size of the water service main to be tapped and select appropriate size fittings including Compression Tee or copper fittings and gate value.
2. Locate and turn off the main water valve on the job site.
3. Use a hacksaw or pipe cutter to tap into the main and install Compression Tee, appropriate adaptors, short length or irrigation main, and gate valve.
4. Clean and sweat a practice copper fitting.
5. Use a hacksaw or pipecutter to tap into the main and sweat the appropriate copper fittings throught the gate valve.
6. Turn the main water valve back on, check for leaks, and refit if necessary.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the advantages and disadvantages of compression fitting vs. copper taps.
2. Demonstrate proper installation of Compression Tee.
3. Demonstrate the proper way to sweat copper.
4. Discuss practical ways to drain water lines such as opening faucets and flushing toilets in the house, and draining the main at the valve union.
5. Discuss the various schedules or classes of PVC pipe and their appropriate uses.
6. Demonstrate proper use of primer, glue, and Teflon in making PVC connections.
7. Discuss types and intened applications of various PVC cements currently available.

INSTUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Actual or simulated 3/4" to 1" service line.
2. PVC and/or copper fittings needed to make tap.
3. Brass gate valve.
4. Pipe wrenches, hacksaw, pipe cutter, propane torch, solder, flux, emery cloth, Teflon tape.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902155, HP486200M, The Toro Company, Riverside, CA.

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.2 **TASK:** Locates existing underground utilities.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given proper tools and a site to be landscaped/irrigated,

EVALUATION: locates existing underground utilities.

STANDARD: Underground utility lines are located and marked with spray paint.

STUDENT LEARNING EXPERIENCES:

1. List the types of underground utility lines which could be present on a job site.
2. Use a probe, tracker, or metal detection device to locate underground lines on a simulated job site.
3. Call the appropriate agencies for "blue stake" services to identify underground utilities on an actual job site.
4. Operate a spray paint type marking device to indicate underground utility lines on the job site.
5. Locate the utility lines on the irrigation plan to determine whether modifications in plan or installation methods may be needed.
6. List potential consequences of damaging various utility lines.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the practical aspects of contractor liability in the event of damage to underground utilities.

2. Discuss possible serious operator injuries caused by hitting utility lines with power equipment.

3. Demonstrate practical repair of cable TV line, which is particularly vulnerable to damage, since it is usually laid shallow.

4. Demonstrate the use of probes, trackers, and detection devices.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Probe, tracker, or other devices which can locate underground lines.

2. Spray paint marking device.

RESOURCES:

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.3 **TASK:** Lays out an irrigation system on site.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an irrigation plan, gypsum or string and stakes, a tape measure and a scale.

EVALUATION: lays out an irrigation system on site.

STANDARD: The layout on the ground will be accurate to within one foot of the layout required by the plan.

STUDENT LEARNING EXPERIENCES:

1. Use an archituctural scale to determine distances of irrigation fixtures from identifiable features on the plan.
2. Use a tape measure to locate irrigation fixtures on the ground.
3. Mark the location of sod heads and/or bubblers with stakes.
4. Determine trench locations and mark with stakes and string or gypsum.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the use of a scale to determine dimensions on plans.
2. Discuss the concept of triangulation as a way to locate irrigation fixtures.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. An irrigation plan and an architectural scale.
2. Stakes, string, hammer, gypsum, 50'-100' tape.

RESOURCES:

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.4 **TASK:** Opens trenches by hand or with a trencher.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an area of ground marked for trenches, hand tools, and a trencher,

EVALUATION: opens trenches by hand or with a trencher.

STANDARD: Trenchers will be opened to a specified width and depth within +- 1", cut straight, and cleaned of loose soil and rock.

STUDENT LEARNING EXPERIENCES:

1. Use hand tools including railroad pick, mattock, digging bar, shovel, spade, and trenching shovel to open and clear a section of trench.
2. Set cutting bar to proper depth and operate a "walk behind" trenching machine to open a section of trench.
3. Clean machine opened trench by hand with trenching shovel.
4. Compare the actual difference in time needed to trench a given section by hand and by machine.
5. Determine the optimum practical depth for the trenches considering the size of the fixture to be installed, environmental factors and future maintenance considerations.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate proper adjustment and operation of a walk behind trencher.

2. Discuss the economic pros and cons of machine vs. hand trenching in residential and commercial projects.

3. Discuss appropriate uses of "sneakers" or pipe pullers, rotary wheel trenchers, and "moles" or boring tools.

4. Discuss practical considerations in selecting a trencher including fitness for purpose (is it hefty enought for local conditions), availability of service, and reputation for reliability.

5. Demonstrate as appropriate that some "walk behinds" are impractical for operators weighing under 150 lbs., as this operator weight will not counterbalance the machine so that it can be turned.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Hand digging tools including picks and assorted shovels and spades.

2. Trenching machine.

3. Manufacturers literature containing specifications and suggested applications of trenching/boring equipment.

RESOURCES:

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.5 **TASK:** Measurers, cuts, and assembles PVC, copper, galvanized pipe and polyethylene tubing.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a site to be irrigated where a tap has been made and the trenches opened, the necessary tools and equipemtn, and the proper quantity of pipe, fittings, and supplies,

EVALUATION: measurers, cuts, and assembles PVC, copper, galvanized pipe and polyethylene tubing.

STANDARD: Pipe will be measured, cut, and assembled as required by the plan, in a manner producing less than 5% waste, and the joints will not leak when the system is pressurized.

STUDENT LEARNING EXPERIENCES:

1. Assemble and install a polyethelene drip line with compression fittings, and emitter tubes as required by the plan.
2. Measure, cut, and assemble a PVC bubbler line as required by the plan using primer and cement.
3. Measure, cut and assemble a PVC turf irrigation line as required by the plan using primer and cement.
4. Measure, cut, thread, and assemble galvanized pipe and fittings as/if required by the plan, or to simulate process of repair of older systems.
5. Measure, cut and sweat copper pipe and fittings as required by the plan.
6. Install risers in system where required by plans.
7. Use a shovel to partially backfill trenches.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the practical aspects of building a system from the laterals back to the box.

2. Review method of determining size of pipe used in laterals and mains. Note: While it is common practice to use single size PVC in most residential applications, large scale applications require the use of pipe in scaled sizes. An understanding of how to determine the required sizes is necessary to pass the AZ State Landscape and Irrigation Contractors license exam.

3. Discuss the practical and economic aspects of using galvanized pipe in irrigation systems.

4. Demonstrate the use of galvanized pipe cutting and threading tools and techniques.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Proper quantity of PVC, polyethelene, galvanized, and copper pipe and fittings to complete the job.

2. PVC primer and cement; teflon tape; solder, flux, emery cloth.

3. Pipe cutting and threading tools.

4. Punch to install emitters or dip tubing.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

98

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.6 **TASK:** Installs valves, pressure vacuum breaker, sprinklers, bubblers, emitters, and soaker tubing to specifications.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a site to be irrigated with tap, main lines, and laterals installed, appropriate hand tools and fittings as specified by the irrigation plan,

EVALUATION: installs valves, pressure vacuum breaker, sprinklers, bubblers, emitters, and soaker tubing to specifications.

STANDARD: Proper components will be selected, oriented correctly with regard to water flow direction and assembled in sequence which permits flushing of the system and the system does not leak when pressurized.

STUDENT LEARNING EXPERIENCES:

1. Install a pressure vacuum breaker in accordance with building code regulations.
2. Flush the system by opening the gate valve.
3. Assemble a valve manifold and install electrically operated valves in a valve box or boxes as specified by plan.
4. Turn on the gate valve to check for and repair leaks if necessary.
5. Install sprinkler heads from valve box out while flushing lines.
6. Install bubbler heads from valve box on out while flushing lines.
7. Install emitter heads from valve box on out while flushing lines.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the proper construction of a valve manifold.
2. Review the importance of flushing the system as it relates to proper operation, customer satisfaction, and minimizing repair of components.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Pressure vaccum breaker, sprinklers, bubblers, and emitters as specified by plan.
2. Wrenches, screwdriver.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.7 **TASK:** Mounts and wires automatic timer to control valves.

PERFORMANCE OBJECTIVE:

CONDITIONS:	Given a landscape plan and a site with all irrigation components installed except an automatic timer, an automatic timer, wire, sealant, connectors and hand tools,
EVALUATION:	mounts and wires automatic timer to control valves.
STANDARD:	Appropriate timer and size of wire is selected, timer is located according to plan, valves are wired sequentially, connections are properly sealed, stations are identified, and wires connected so that all valves work.

STUDENT LEARNING EXPERIENCES:

1. Identify the various types and capacities of timing devices.
2. Select the appropriate timer for the given landscape plan.
3. Mount a timer in a specified location using proper tools and fasteners.
4. Determine the proper size wire required from the valves to the timer.
5. Wire valves using appropriate connectors and sealants.
6. Wire the timer to an electrical source.
7. Test run valve connections by operating timer manually through the stations.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the differences between electronic and electro-mechanical clocks, indoor and outdoor cases, and single and dual program clocks.

2. Review use of a chart which can be used to determine the required gauge of wire for a given installation. Note: An understanding of how to read this chart is required by the State in its Landscape/Irrigation contractor's exam.

3. Discuss the difference between wiring in series and wiring in parallel.

4. Demonstrate the proper methods of wiring into a breaker box.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Distributor catalogs or manufacturer specification sheets for automatic timing devices.

2. A conversion chart to determine appropriate wire guage.

3. A timer, wire, screwdriver, electric drill, wire connectors, sealant, electrical tape.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.8 **TASK:** Tests and adjusts sprinkler spray patterns for proper coverage.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an operating sprinkler irrigation system and hand tools,

EVALUATION: tests and adjusts sprinkler spray patterns for proper coverage.

STANDARD: All sprinkler heads will be operating and adjusted to provide minimum overspray beyond the intended area of irrigation.

STUDENT LEARNING EXPERIENCES:

1. Adjust pop-up sprinkler heads manually or with a wrench until the spray is properly directed to the turf area.
2. Regulate spray from pop-up heads with a screwdriver to adjust volume and/or reduce overspray.
3. Adjust pattern of impact heads to increase coverage or reduce overspray.
4. Adjust pattern of rotary heads to increase coverage or reduce overspray.
5. Adjust volume of water from bubble heads to provide equal amounts of irrigation to plants of like size.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the ways in which pop-up, impact, and rotary heads may be adjusted for pattern and volume.
2. Review the potential efficiency of using newer style bubble heads with pre-set variable flow rates to balance bubble irrigation systems.
3. Review the possibilities of balancing a drip irrigation system by using different size emitters or more than one emitter tube to trees and sizeable shrubs.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Irrigation wrench, channel locks, Phillips head and small screwdrivers.
2. Assortment of pop-up, impace, rotary, and bubbler heads.

RESOURCES:

TORO PLANNING AND INSTALLATION GUIDE, Form #4902155, HP486200M, The Toro Company, Riverside, CA.

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.9 **TASK:** Backfills trenches.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an installed and adjusted irrigation system,

EVALUATION: backfills trenches.

STANDARD: Trenches will be backfilled with compacted soil so that they will not sink and are level with desired final grade.

STUDENT LEARNING EXPERIENCES:

1. Backfill trenches with a shovel.
2. Water the trenches as necessary to "settle" them and backfill again if required.
3. Rake the trenches level with desired finished grade.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss reasons for compacting the trenches.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Shovel or spades, hose, rake.

RESOURCES:

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.10 **TASK:** Establishes final grade to proper height.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an installed and backfilled irrigation system,

EVALUATION: establishes final grade to proper height.

STANDARD: Site is cleared of excess soil and debris and raked level to within 1/2" of desired final height.

STUDENT LEARNING EXPERIENCES:

1. Rake and/or shovel site to smooth finished grade.
2. Remove rocks, debris, and excess soil from site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss practical reasons like preventing runoff and contractor responsibility for restoring site to grade.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Shovels, rakes.

RESOURCES:

6.0 **COMPETENCY/SKILL:** Installs irrigation systems.

6.11 **TASK:** Prepares a bid.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an irrigation system plan, a Bill of Materials and materials cost summary, and an on site analysis,

EVALUATION: prepares a bid for an irrigation job.

STANDARD: Bid will reflect consideration of costs of materials and labor, labor burden, overhead, and anticipated percentage of profit and be acceptable if within 15% of the consensus bid.

STUDENT LEARNING EXPERIENCES:

1. Determine a fair rate for irrigation installation labor based on local economic conditions.
2. Determine a fair rate for irrigation installation supervision based on local economic conditions.
3. Estimate the number of labor hour and supervisory hours required to complete the plan as given.
4. Determine the factors which constitute overhead, and assign a percentage of cost.
5. Define the term "labor burden" and assign a percentage of cost.
6. Identify job site vairables which may affect installation costs.
7. Determine a desired profit percentage and factor it as a percentage of total costs.
8. Organize and present a bid for the installation of the irrigation job as specified.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Compare the pro's and con's of unit price bidding, i.e., so much per sprinkler head, so much per valve line, so much per square foot of coverage etc., vs. detailed cost analysis.

2. Review the meaning of the terms overhead, labor burden, and profit. Note: Familiarity with basic principle of conducting a small business is required by the State of Arizona in its contractors liscense exams.

3. Discuss factors affecting the sale of an irrigation job, including professional presentation, and competitive price.

4. Discuss "overhead" factors which affect even the smallest installation crews such as time spent developing bids, time spend making "free" estimates, gas for the truck, broken or lost tools, etc.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. An irrigation plan and materials cost summary.

2. Sample sheets for calculating bids by various methods.

RESOURCES:

ESTIMATING AND MANAGEMENT PRINCIPLES FOR LANDSCAPE CONTRACTORS, Charles Vander Kooi, California Landscape Contractors Association, Sacramento, CA., 1985.

7.0 **COMPETENCY/SKILL:** Operates/maintains sprinkler systems.

7.1 **TASK:** Determines appropriate start and run times for an automatic irrigation system.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a fully landscaped area ready to be irrigated by an automatic watering system,

EVALUATION: determines appropriate start and run times for an automatic irrigation system.

STANDARD: Start and run times selected will maximize plant health while minimizing water use as evidenced by no "run off" at the end of the water cycle and with detectable soil moisture at least 6" deep after watering turf.

STUDENT LEARNING EXPERIENCES:

1. List probable consequences of overwatering and underwatering landscape installations.
2. Compare the benefits of deep, periodic irrigation vs. frequent, shallow irrigation.
3. Interpret from a manufacturers specification sheets how many gallons of water are distributed per hour by given sprinkler heads, bubble heads, and drip emitters.
4. List most appropriate start times, day frequency, and run times for a given landscape installation.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Identify common diseases of turf associated with improper water practices.
2. Discuss the problems caused by salt build up common to heavy alkaline soils frequently found in Arizona.
3. Discuss water conservation concepts relating to turf management.
4. Compare and demonstrate uses of contemporary soil moisture sensing devices which can be used to override an automatic system.
5. Discuss practical consideration used in determining start/run times, i.e. turf receiving heavy day traffic usually needs to "dry down" before the day's activities; turf which is mowed on a regular schedule shouldn't be watered immediately before or during mowing operations.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Manufacturer's specification sheets detailing sprinkler head output.
2. Manufacturer's literature and/or sample moisture sensing devices.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 27-32, Arizona Nursery Association, Phoenix, AZ., 1981.

7.0 **COMPETENCY/SKILL:** Operates/maintains sprinkler systems.

7.2 **TASK:** Programs automatic timers.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a list of start/run times by station and an installed automatic timing device,

EVALUATION: programs automatic timers.

STANDARD: Timers will be programmed so that cycle start and station run times conform to the specifications as evidenced by visual inspection of an electro-mechanical timer or by checking individual and cycle settings of an electronic timer.

STUDENT LEARNING EXPERIENCES:

1. Interpret a manufacturer's instruction manual and program an electro-mechanical timer.
2. Interpret a manufacturer's instruction manual and program an electronic timer.
3. Check to see that each valve is programmed to start by running through the station manually.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the basic time factors involved in timer irrigation: day frequency, start time, run time, and total time of cycle.
2. Demonstrate proper programming of electronic timers.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Automatic timing devices and instruction booklets.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 27-32, Arizona Nursery Association, Phoenix, AZ., 1981.

7.0 **COMPETENCY/SKILL:** Operates/maintains sprinkler systems.

7.3 **TASK:** Adjusts sprinkler patterns to maintain proper coverage.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a plot plan with irrigation components located and identified, and working flow rate determined,

EVALUATION: adjusts sprinkler patterns to maintain proper coverage.

STANDARD: The flow rate required by any given circuit does not exceed the available flow rate of the system and the flow rates of the circuits are balanced with respect to each other.

STUDENT LEARNING EXPERIENCES:

1. Calculate the water flow requirements of all turf irrigation heads on the plot plan to determine how many gpm the system requires to operate.
2. Divide the heads needed to irrigate the turf area into two or more circuits of relatively equal flow rates if the total gpm required is greater than the system can handle on one circuit.
3. Determine the gph requirements of drip emitters on the plan. If greater than 240 gph, divide into two or more balanced

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss practical and environmental factors which influence division of heads into circuits.
2. Demonstrate a basic circuit layout of a lawn area.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Plot plan with irrigation components located and identified.

RESOURCES:

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL, Rain Bird Sales, Inc., Turf Division, Glendora, CA. 1984.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902115, HP486200M, The Toro Company, Riverside, CA.

7.0 **COMPETENCY/SKILL:** Operates/maintains sprinkler systems.

7.4 **TASK:** Troubleshoots irrigation hydraulic and electrical systems.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a malfunctioning irrigation system, hand tools, and electrical testing devices,

EVALUATION: troubleshoots irrigation hydraulic and electrical systems.

STANDARD: Problems in the hydraulic and electrical systems will be diagnosed and the systems restored to operating order.

STUDENT LEARNING EXPERIENCES:

1. Identify common problems in irrigation hydraulic and electrical systems.
2. Identify safety precautions to be followed when working with electrical systems.
3. Use and interpret the readings of a volt-ohm meter.
4. Use and interpret the readings of probe and tracking devices.
5. Restore electrical continuity in the system and reset timing device if/as required.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the most frequently encountered hydraulic and electrical problems such as dirt clogging a valve, clock malfunctioning due to power outage and/or dead battery backup, corroded connections, bad solenoids, and broken wires.

2. Demonstrate the use of a VOM to test circuits.

3. Demonstrate the use of probe and tracking devices to locate underground wires.

4. Disable an operative irrigation system so that problems can be located and repaired.

5. Discuss safety precautions to be followed while working with low voltage and 120 volt electrical systems.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. An installed irrigation system which may be temporarily disabled.

2. Screwdrivers, wrenches.

3. Volt-ohm meter, probe, tracker.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 27-32, Arizona Nursery Association, Phoenix, AZ., 1981.

7.0 **COMPETENCY/SKILL:** Operates/maintains sprinkler systems.

7.5 **TASK:** Determines sprinkler precipitation rate in inches per hour.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an operating sprinkler system, rain gauges and/or tin cans and a ruler,

EVALUATION: determines sprinkler precipitation rates in inches per hour.

STANDARD: Precipation rates will be determined to within 1/4" per hour as evidenced by physical comparative measurement.

STUDENT LEARNING EXPERIENCES:

1. Place rain gauges in appropriate spots to catch sprinkler precipitation; run valve line manually for 30 minutes, and interpret reading.
2. Place tin cans in appropriate spots to catch sprinkler precipitation; run valve line manually for 30 minutes, measure and interpret reading.
3. Adjust run times to reflect required inches of water per watering day recommended for optimum plant growth and optimum water conservation.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss reasons why reading from more than one gauge is likely to produce a more accurate average precipation rate than a reading from a single gauge.
2. Discuss environmental factors which will affect the desired amount of precipation during a given season.
3. Present locally applicable recommendations for optimum water rates as published variously by water boards and County Extention Services.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Plastic rain gauges.
2. Empty coffee cans, ruler.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 27-32, Arizona Nursery Association, Phoenix, AZ., 1981.

7.0 **COMPETENCY/SKILL:** Operates/maintains sprinkler systems.

7.6 **TASK:** Removes/repairs/replaces worn or damaged components.

PERFORMANCE OBJECTIVE:

See Tasks 5.5, 5.6, 5.7, 5.8.

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

8.0 **COMPETENCY/SKILL:** Designs landscapes (irrigation systems excluded).

8.1 **TASK:** Identifies basic principles of landscape design.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an installed landscape,

EVALUATION: identifies basic principles of landscape design.

STANDARD: Principles identified include form, color, texture, repetition, balance, symmetry, scale, and function as evidenced by 70% accuracy on a post test.

STUDENT LEARNING EXPERIENCES:

1. Define the principles used in landscape design.
2. Survey neighborhood residential or commercial landscapes and identify priciples the designer employed.
3. List 20 ornamental plants used in neighborhood landscaping which show different colors.
4. List 20 ornamental plants used in neighborhood landscaping which exhibit different textures, and describe their textural effect.
5. Increase the apparent size of a structure drawn to scale to sketching in large or small trees.
6. Decrease the apparent size of a structure drawn to scale to sketching in large or small trees.
7. Identify a neighborhood formal and informal landscape and describe them in terms of elements of landscape design.
8. Identify 3 neighborhood landscapes which successfully create a focal point, and describe the elements of design which make them work.
9. Identify and describe 3 neighborhood landscapes which significantly violate principles of landscape design.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the benefits of good landscape design to the homeowner, neighborhood, and community.
2. Compare the effects of well installed, good landscape design with the effects of well installed poor landscape design.
3. Compare an effective, simple landscape with an unsuccessful elaborate landscape to suggest that good design is not necessarily a function of available budget.
4. Establish the role of the designer as it relates to the sales process in design firms and to design/build contractors.

INSTRUCTIONAL EQUIPMENT, MATERIALAS, AND SUPPLIES:

1. Sample slides or illustrations detailing effective landscape design which uses plant material appropriate for local conditions.
2. Sample slides or previously identified locations which illustrate serious flaws in design effort.
3. Worksheets with the front elevations of area typical homes drawn to scale.
4. Reference copies of "Plants for Dry Climates" or other area specific plant identification guides.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 50-53, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocatinal Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructinal Services, College Station, TX., 1985.

8.0 **COMPETENCY/SKILL:** Designs landscapes (irrigation systems excluded).

8.2 **TASK:** Identifies factors to be considered before beginning a landscape design.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a site to be landscaped, a site analysis check list, and a checklist of client needs and preferences,

EVALUATION: identifies factors to be considered before the landscape design.

STANDARD: Factors identified will express an understanding of site analysis, theme, owner needs, likes, dislikes, and special considerations as evidenced by completion of site and owner-needs checklists.

STUDENT LEARNING EXPERIENCES:

1. List the steps that need to be taken prior to beginning a landscape design.
2. Obtain a new home plot plan from a developer and locate house features such as windows, doors, best views, height and type of fences, and existing vegetation if any, or measure and draw a new home plot plan to scale.
3. Complete a site analysis checklist.
4. Consult with the actual or a hypothetical homeowner to complete a client needs and preference checklist.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Compare the advantages and disadvantages of designing to a budget vs. designing to meet needs.

2. Analyze the actual cost of a "free" design service as often offerred by smaller residential design-build contractors; who pays for it up front; who pays in the end; is it an effective sales tool?

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Site analysis and client needs and preference checklists.

2. 50' or 100' tape measure.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 50-53, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATING STUDENT MATERIALS, CAT #31A, Unit N, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 8, Vocational Instructional Services, College Station, TX., 1985.

8.0 **COMPETENCY/SKILL:** Designs landscape (irrigation systems excluded).

8.3 **TASK:** Identifies landscape plants by common and botanical names.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a broad selection of locally used landscape plants or show a selection of slides/pictures of locally used landscape plants,

EVALUATION: identifies landscape plants by common and botanical names.

STANDARD: Plants will be identified and names spelled correctly.

STUDENT LEARNING EXPERIENCES:

1. Define the terms "genus", "species", "variety", and "cultivar".
2. Make a bulletin board consisting of photographs of locally used plant material identified by common and botanical names.
3. Make a plant notebook consisting of photographs, leaf samples, and descriptions of the characteristics of locally used plant material identified by common and botanical names.
4. Tour school campus or neighborhood and use a picture reference guide such as "Western Home Landscaping" or "Plants for Dry Climates" to identify plants by common and botanical name.
5. Visit a local nursery and identify plants by both common and botanical names.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the probable consequences of failure to specify plant material by botanical name on the landscape design.
2. Review the basics of plant taxonomy as a system of identification.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Broad selection of locally used plant material to be identified, a site containing such a selection, or pictures.
2. Reference copies of "Western Home Landscaping", Sunset's "Western Garden Guide" and "Plants for Dry Climates".

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 1-9, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 1, Vocational Instructional Services, College Station, TX., 1985.

8.0 **COMPETENCY/SKILL:** Designs landscapes (irrigation systems excluded).

8.4 **TASK:** Selects and locates plant materials on the plan using appropriate graphic symbols.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a site plan, drafting scale, circle template, ruler, compass, and sample graphic symbols,

EVALUATION: selects and locates plant materials on the plan using appropriate graphic symbols.

STANDARD: Plant material selected will be appropriate for intended use; appropriate symbols will be selected and drawn to a scale representing the mature size of the plant.

STUDENT LEARNING EXPERIENCES:

1. Draw commonly used graphic symbols which represent different types of plant material.
2. Select plant material for the landscape plan and draw representative symbols to scale.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss advantages and disadvantages of using graphic aids such as templates, stamps, and transfers in preparing landscape graphics.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Samples of commonly used landscape symbols.
2. Architectural scales, circle templates, compassess, ruler or straightedge.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 50-53, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocatinal Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructinal Services, College Station, TX., 1985.

8.0 **COMPETENCY/SKILL:** Design landscapes (irrigation systems excluded).

8.5 **TASK:** Selects and locates appropriate complements.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a site plan, and samples of graphic symbols,

EVALUATION: selects and locates appropriate complements.

STANDARD: Complements selected from among gravel, boulders, cinders, bark, river rock, etc will be represented by the appropriate graphic symbol on the plan.

STUDENT LEARNING EXPERIENCES:

1. Compare and contrast the qualities of bark, granite, gravel, and cinders as ground covering complements.
2. Identify the uses of boulders and river rocks as landscape complements.
3. List the types and functions of complements found in a survey of neighborhood landscape installations.
4. List the types and functions of complements found in a tour of school campus.
5. Draw the appropriate graphic symbols for the complements selected on the landscape plan.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the concepts of balance and symmetry in design as they relate to selecting complements.

2. Suggest ways in which different complements may alter the feeling of a landscape, i.e., white rock may suggest formality, bark chips may suggest an informal forest floor, etc.

3. Discuss practical and aesthetic consequences of choosing too many different types of complements for a given landscape.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Site plan; samples of graphic symbols, drafting equipment.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 50-53, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocatinal Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructinal Services, College Station, TX., 1985.

8.0 **COMPETENCY/SKILL:** Designs landscapes (irrigation systems excluded).

8.6 **TASK:** Makes preliminary sketches suitable for client evaluation.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a site plan, an analysis of client needs and desires, and drafting equipment,

EVALUATION: makes preliminary sketches suitable for client evaluation.

STANDARD: Sketches will reflect consideration of client needs and desires in balance with limitations presented by the site, and features will be indicated by appropriate graphic symbols.

STUDENT LEARNING EXPERIENCES:

1. Identify the areas of a landscape.
2. Review functional considerations of a landscape and site limitations to be considered.
3. Make preliminary sketches of landscape design elements on tissue laid over the site plan.
4. Use drafting equipment of draw a preliminary landscape design to scale.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss practical reasons why it is important to have a good sense of client wants prior to beginning the design process.
2. Discuss the responsibility of the designer and possible techniques to lead clients to acceptance of sound design principles.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Site plan, tissue, and drafting equipment.
2. Client needs and desires checklist.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 50-53, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocatinal Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructinal Services, College Station, TX., 1985.

8.0 **COMPETENCY/SKILL:** Designs landscapes (irrigation systems excluded).

8.7 **TASK:** Uses drafting equipment to draw plans to scale.

PERFORMANCE OBJECTIVE:

See Tasks 4.1, 4.2, 5.3

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

8.0 **COMPETENCY/SKILL:** Designs landscapes (irrigation systems excluded).

8.8 **TASK:** Develops a legend for a landscape plan identifying all plant materials, complements, and hardscape features.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a completed landscape plan with all features located,

EVALUATION: develops a legend for a landscape plan identifying all plant materials, complements, and hardscape features.

STANDARD: Plant material will be listed by key number, quantity, common name, botanical name, and size to be installed; compliments and hardscape features will be listed by key number, quantity, identifying name, size, or components as appropriate, so that all elements on the landscape plan are identified and accounted for.

STUDENT LEARNING EXPERIENCES:

1. Summarize the steps in developing a legend.
2. Identify all plant materials, complements, and hardscape features on a given landscape design, and list on the plan in legend format.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss various reasons why accuracy is important in the development of a legend, i.e., it may become part of a contract basis between client and landscaper, it will be used by a contractor to order material, and it is a client's way of checking that a job was installed as bid.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Sample legend and a completed landscape design.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 50-53, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocatinal Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructinal Services, College Station, TX., 1985.

8.0 **COMPETENCY/SKILL:** Designs landscapes (irrigation systems excluded).

8.9 **TASK:** Uses color to enhance finished plans.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a completed landscape plan, and an assortment of coloring materials,

EVALUATION: uses color to enhance finished plans.

STANDARD: Colors selected will clarify the designers intention for the client and contractor.

STUDENT LEARNING EXPERIENCES:

1. List materials which can be used to color designs.
2. Discuss methods by which color can clarify the designers intent.
3. Use color to enhance a landscape design.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review reasons why color is often most effective when used selectively on a landscape design.
2. Discuss practical reasons for not coloring an original design until blue prints or other copies have been pulled.
3. Relate the appropriateness of colored sketches to the sales process.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Completed landscape plan.
2. Watercolors, felt tip markers, colored pencils, Prang paints, and charcoal pencils.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 50-53, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocatinal Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructinal Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigations systems excluded).

9.1 **TASK:** Identifies state licensing regulations pertaining to the landscape industry.

PERFORMANCE OBJECTIVE:

CONDITIONS:	Given a landscape business, and appropriate information from the Arizona Registrar of Contractors,
EVALUATION:	identifies state licensing regulations pertaining to the landscape industry.
STANDARD:	Regulations concerning who may apply for the license, the steps needed to complete the application, testing procedures, and the scope of activities permitted the contractor are accurately identifed.

STUDENT LEARNING EXPERIENCES:

1. Define the term "qualifying party" and identify his or her necessary background in the landscape industry.
2. Identify the purpose of a bond and its relationship to the Contractors Recovery fund.
3. Identify the types of work which can be performed under a C21 Landscape and Irrigation license.
4. Call the Registrar of Contractor's to determine current license fees and bond requirements for a Landscape Contractor.
5. List the steps necessary to obtain a Landscape Contractor's license.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Introduce the business concepts which must be understood to pass the contractor's license exam.
2. Discuss the advantages a homeowner may anticipate when dealing with a licensed contractor.
3. Discuss recent changes in licensing requirements which affect landscaping of commercial (non-homeowner) projects.
4. Discuss types of projects under $750.00 which might reasonably be accomplished by the unlicensed landscaper.
5. Present a landscape contractor as a guest speaker whom the class may interview.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Current information pertaining to licensing requirements from the Arizona Registrar of Contractors.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ. 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1894.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ. pp. 50-53. 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructional Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.2 **TASK:** Interprets landscape plans.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a completed landscape plan with a legend,

EVALUATION: interprets the landscape plan.

STANDARD: All elements on the landscape plan will be properly identified from the legend.

STUDENT LEARNING EXPERIENCES:

1. Locate all plant material listed in the legend on the landscape plan.
2. Located hardscape features and complements listed in the legend on the landscape plan.
3. Visit the job site if/as appropriate to determine whether the landscape can be installed as drawn, or whether modifications need to be made.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review as necessary the elements found in a landscape legend.
2. Discuss the responsibility of the contractor to fully examine the plans before beginning excavation in terms of evaluating plant material, hardscpes, and compliments for fitness of purpose, i.e., if a plant dies because it is unsuited for the area, it is the contractor's responsibility, not the designer.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Completed landscape plan with a legend.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ. 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1894.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ. pp. 50-53. 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructional Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.3 **TASK:** Estimates the total amount of materials needed to complete a landscape installation.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape plan and applicable formulas for estimating quantities, and an architect's scale,

EVALUATION: estimates the total amount of materials needed to complete a landscape installation.

STANDARD: The amount of materials estimated will be correct for the given plan.

STUDENT LEARNING EXPERIENCES:

1. Use an architects scale to determine square footage of ground to be covered by sod, seed, groundcovers, and rock mulches as required by the plan.
2. Use appropriate formulas to determine the quantities of seed, organic mulch, groundcovers, and rock mulches as required by the plan.
3. Estimate the quantities of brick, mortar, concrete, lumber, block, and topsoil required by the plan using appropriate formulas.
4. List the plant material by common and botanical names, container size, and quantity required by the plan.
5. Prepare a Bill of Materials required to complete the landscape installation.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review appropriate formulas used to determine coverages of commonly used landscape materials.

2. Discuss reasons why accurate estimates are important to the success of a job, i.e., five tons too much granite can cause as big a problem as coming up short, and inaccurate estimates of materials make it difficult to present a fair and competitive bid.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Completed landscape plan and architect's scale.

2. Appropriate formulas for determining the coverage of groundcovers on a given spacing, various complements, mulches, brick, mortar, concrete, and block.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ. 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ. pp. 50-53. 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructional Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.4 **TASK:** Contours soil surface to promote proper drainage and/or create a desired effect.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape plan and a landscape to be installed, a small tractor, a rototiller, a wheelbarrow, shovels, rakes, soil, and or organic mulch,

EVALUATION: contours soil surface to promote proper drainage and/or create a desired effect.

STANDARD: Soil will be contoured to the specifications of the landscape plan.

STUDENT LEARNING EXPERIENCES:

1. Identify probable consequences of an improperly drained landscape.
2. Describe landscape features which can promote drainage.
3. Operate a small tractor with gannon to level and grade as required by the plan.
4. Operate a small tractor to create a drainage swale (ditch) as required by the plan.
5. Operate a small tractor with front loader to build and compact a berm as required by the plan.
6. Hand grade a site withshovels and rakes.
7. Operate a rototiller to prepare ground for seed or sod and hand grade with shovels and rakes.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the proper operation of a small tractor with gannon and front loader.
2. Demonstrate the proper use of a rototiller.
3. Review formulas for calculating the amount of soil needed to construct a berm of given size and/or to determine proper quantity of mulch to be tilled into a given area.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Landscape to be installed.
2. Small tractor with gannon and front loader.
3. Roto-tiller.
4. Assorted rakes, shovels, and a wheelbarrow.

RESOURCES:

HOW TO SELECT, USE, AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1894.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 5, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit F, Vocational Instructional Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.5 **TASK:** Installs plant materials so as to minimize shock and encourage plant growth.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape plan, plant material to be installed, shovels, picks, a hose, can cutter, and water source,

EVALUATION: installs plant materials so as to minimize shock and encourage plant growth.

STANDARD: Material will be planted in holes dug to proper width and depth, holes will be backfilled with ammended soil, and the root balls will be handled in such a way that shock is minimized and the plants survive.

STUDENT LEARNING EXPERIENCES:

1. List the steps necessary in planting balled and burlapped or container grown trees and shrubs.
2. List the steps necessary in planting bare root trees and shrubs.
3. Locate the positions of plant material on the job site.
4. Use picks and shovels as required to dig the planting holes.
5. Plant the appropriate trees and shrubs using recommended procedures.
6. Stake and guy trees according to proper procedures.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the probable consequences of failing to pre-water plant holes or to check for proper drainage when planting in Arizona soils.

2. Demonstrate the proper way to carry containerized plants or move balled and burlapped nursery stock.

3. Demonstrate the proper way to remove plants from their containers.

4. Demonstrate if applicable the use of a power auger to start plant holes or cut drainage chimneys.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Landscape plan, site to be landscaped, mulch, and plant material.

2. Picks, shovels, pry bar, hose, wheelbarrow, clamshell digger, and power auger as appropriate.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL pp. 68-72, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 5, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit F, Vocational Instructional Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.6 **TASK:** Applies preemergence herbicides or black plastic to control initial weed growth.

PERFORMANCE OBJECTIVE:

See Tasks 2.11, 3.2, 3.3, 3.4, 3.5

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.7 **TASK:** Installs complements.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape installation to be completed, a small tractor, shovels, rakes, a wheelbarrow, and required quantity of compliments,

EVALUATION: installs complements.

STANDARD: Complements will be installed in the appropriate areas to a unifrom depth as specified by the landscape plan.

STUDENT LEARNING EXPERIENCES:

1. Use a pick and/or shovel to clean out the edges of borders intended to keep a complement in place.
2. Operate a small tractor to distribute granite as appropriate.
3. Use a shovel, rake, and wheelbarrow to distribute and level granite or other complements.
4. Operate a small tractor to place boulders as appropriate.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review factors involved in choosing appropriate compliments.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. A landscape installation to be completed, shovels, rakes, wheelbarrow, and a small tractor.

RESOURCES:

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 3, Vocational Instructional Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.8 **TASK:** Cleans up the job site.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a completed landscape installation, rakes, shovels, brooms, hose and container for debris,

EVALUATION: cleans up the job site.

STANDARD: All incidental trash and debris will be removed from the job site; walls and walks will be broomed and washed free of soil and stains, plant material will be groomed if/as required.

STUDENT LEARNING EXPERIENCES:

1. Use hand tools to cleans up a job site.
2. Prepare and use a muriatic wash to clean mortar from brick.
3. Use hand pruners to groom plant material if needed.
4. Clean and store all tools used on the job site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Introduce the concept of "post-selling" on a job, i.e., the more satisfied a customer is with installation and clean-up, the more likely one is to receive referrals.
2. Discuss the benefits of cleaning up as you go in terms of practicality, and keeping the customer satisfied.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Rakes, shovels, broom, hose, garbage bags, containers.
2. Muriatic acid, sponges, rubber gloves, wire brush.

RESOURCES:

PLANTS FOR DRY CLIMATES, Duffield and Jones, HP Books, Tucson, AZ. 1981.

ALL ABOUT LANDSCAPING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ. pp. 50-53. 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, Vocational Instructional Services, College Station, TX., 1985.

9.0 **COMPETENCY/SKILL:** Installs landscapes (irrigation systems excluded).

9.9 **TASK:** Develops a bid for a landscape installation job.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape design, a Bill of Materials and materials cost summary,

EVALUATION: develops as bid for a landscape installation job.

STANDARD: Bid will reflect consideration of costs of materials and labor, labor burden, overhead, and anticipated percentage of profit and be acceptable if within 15% of the consensus bid.

STUDENT LEARNING EXPERIENCES:

1. Determine a fair rate for landscape installation labor based on local economic conditions.
2. Determine a fair rate for labor supervision based on local economic conditions.
3. Estimate the number of hours required to complete the plan as given.
4. Determine the factors which constitute overhead, and assign a percentage of cost.
5. Define the items which constitue "labor burden" and assign a percentage of cost.
6. Determine a desired profit percentage and factor it in as a percentage of total costs.
7. Organize and present a bid for installation of the landscape as specified.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Compare the pro's and con's of unit price bidding, i.e., so much per 1 gallon can installed, so much per 5 gallon, so much per square foot of gravel or brick etc., vs. detailed cost analysis.

2. Introduce the benefits of keeping job cost records to serve as a continuing source of bidding information, and as the basis of creating a unit cost bid system based on conditions most frequently encountered.

3. Present a sample landscape contract and discuss negotiations with clients which may affect the finished price.

4. Discuss the differences between making a wage for labor performed, paying for the overhead which keeps a business intact, and taking a profit.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. A landscape plan and Bill of Materials.

2. Sample landscape installation contracts.

RESOURCES:

ESTIMATING AND MANAGEMENT PRINCIPLES FOR LANDSCAPE CONTRACTORS, Charles Vander Kooi, California Landscape Contractors Association, Sacramento, CA., 1984.

10.0 **COMPETENCY/SKILL:** Constructs hardscape features.

10.1 **TASK:** Measures, cuts, and fastens lumber using nails and/or threaded fasteners.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a deck plan, and the necessary materials and tools,

EVALUATION: measures, cuts, and fastens lumber using nails and/or threaded fasteners.

STANDARD: Lumber will be accurately measured and cut to reflect minimum waste, fasteners will be of the required size for intended use; installation will be level, and conform to the dimensions of the plan.

STUDENT LEARNING EXPERIENCES:

1. Identify the terms "footing, pier, post, beam, joist, decking, ledger board, header, and flashing" as they relate to deck construction.
2. Differentiate between the "nominal" and "actual" sizes of lumber.
3. List the sequence of steps needed to install a deck.
4. Use a framing square, line level, and plumb line to locate posts.
5. Use a carpenter's level to plumb a post.
6. Use a tape measure and square to mark lumber for cutting.
7. Use a circular saw to cut lumber to size.
8. Use an electric drill and socket wrench to install carriage bolts as required.
9. Use a socket wrench to install lag bolts.
10. Install beam saddles and joist hangers as required.
11. Install decking with hammer and nails or electric screw driver and deck screws.
12. Measure, cut, and install decking, header, rails and fence top as required.
13. Use a framing square to lay out stair stringers.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate proper safe use of power saws.
2. Identify and demonstrate uses of common carpenty tools.
3. Discuss measures used to preserve wood hardscape features, i.e., sealing, staining, elevating on piers.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Pick, shovel, hammers, nails, wrenches, screwdrivers, fastening devices, framing square, line level, plumb bob, string, carpenters level, circular saw, extention cords.
2. Lumber, concrete, and fittings as required.

RESOURCES:

HOW TO DESIGN AND BUILD DECKS AND PATIOS, T. Jeff Williams, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 3, F, 1-2, Vocational Instructional Services, College Station, TX., 1985.

10.2 **TASK:** Constructs forms for concrete.

PERFORMANCE OBJECTIVES:

CONDITIONS: Given a plan with concrete hardscape features to install, needed lumber and tools,

EVALUATION: constructs forms for concrete.

STANDARD: Forms will be constructed according to specifications of the plan and installed so that they are level and do not bow when the concrete is poured.

STUDENT LEARNING EXPERIENCES:

1. List ways in which concrete is frequently used in the landscape.
2. Use hand tools to grade site prior to forming.
3. Measure, cut, and install lumber concrete forms.
4. Excavate for, install, and backfill cardboard forms for piers if/as required.
5. Excavate trenches for footings if/as required.
6. Place and tie rebar if/as specified.
7. Measure, cut, and assemble form for concrete stair if/as required.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review probable consequences of improper grading and forming.
2. Review applicable building codes relating to concrete installation.
3. Discuss landscape contractor's limitations regarding the installation of concrete.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Concrete forming materials and/or forms.
2. Picks, shovels and materials for sub-base if/as needed.
3. Hand and power tools to level, cut, and assemble lumber.
4. Rebar, wire, and pliers if/as needed.

RESOURCES:

HOW TO DESIGN AND BUILD DECKS AND PATIOS, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1983.

INTRODUCTION TO ORNAMENTAL HORTICULUTURE, CAT #115B, Unit E, 3, F, 1-2, Vocational Instructional Services, College Station, TX., 1985.

10.0 **COMPETENCY/SKILL:** Constructs hardscape features.

10.3 **TASK:** Places, finishes, and cures concrete according to guide lines.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given concrete forms in place, ready mix concrete, or concrete components and the necessary tools,

EVALUATION: places, finishes, and cures concrete according to guidelines.

STANDARD: Concrete will be ordered or mixed with minimum waste, placed in forms to required depth, and finished to desired effect with appropriate tools.

STUDENT LEARNING EXPERIENCES:

1. Tour a residential or commercial neighborhood and identify uses of concrete and types of finishes.
2. Identify the components and proportions of a standard concrete mix.
3. Use a chart to determine the volume of concrete in cubic yards required to cover a given square footage to a given depth.
4. Identify the tools commonly used in finishing concrete.
5. Mix, place, and finish concrete by hand in small forms.
6. Place and finish pre-mix concrete in larger forms as required.
7. Clean up all tools and equipment.
8. List methods for curing concrete given Arizona's climate extremes.
9. Cure poured and finished concrete according to seasonal requirements.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Introduct and demonstrate the use of concrete finishing tools.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Concrete finishing tools: trowels, striker board, level, floats, darby, shovels, wheelbarrow.
2. Ready mix concrete, premix concrete, or concrete components as required by project.
3. Work gloves, rubber boots and old or protective clothing.

RESOURECES:

HOW TO DESIGN AND BUILD DECKS AND PATIOS, Ortho Books, Consumer Products Division, San Francisco, CA., 1984.

10.0 **COMPETENCY/SKILL:** Constructs hardscape features.

10.4 **TASK:** Lays block.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a block feature to install, a prepared footing, block, mortar, and hand tools,

EVALUATION: lays block.

STANDARD: Block will be laid in level courses with uniform mortar joints.

STUDENT LEARNING EXPERIENCES:

1. Identify common sizes and appropriate uses of block material.
2. Estimate the quantity of block and mortar needed to complete a given block wall installation.
3. Install stake and string guides to set courses.
4. Use a mason's level to plumb corners.
5. Mix and prepare mortar according to manufacturer's directions.
6. Use a trowel to place mortar and lay block.
7. Use a power saw with masonry blade to cut block if/as required.
8. Clean up tools and job site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate mixing of mortar to its proper consistency.
2. Review regulations relating to the scope of a block project which can be performed under a landscape license.
3. Identify the types of block material available and suggest appropriate uses.
4. Demonstrate the safe use of a masonry saw.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Protective clothing, gloves, and goggles.
2. Masonry block, mortar, hose, water source.
3. Wheelbarrow, shovel, level, string, stakes, masonry hammer, power saw, masonry blade, brick set, joint tool, rubber mallet, pointed trowel.

RESOURCES:

GARDEN CONSTRUCTION KNOW HOW, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

10.5 **TASK:** Lays brick.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a brick hardscape feature to install, brick, mortar, sand, and appropriate tools,

EVALUATION: lays brick.

STANDARD: Brick will be laid level with uniform joints and trimmed to reflect minimum waste.

STUDENT LEARNING EXPERIENCES:

1. List the steps necessary to install mortared brick and sand set brick and identify advantages of each system.
2. Identify patterns commonly used in laying brick patios.
3. Estimate the quantity of brick required to complete a given hardscape feature.
4. Prepare a site as required to receive sand set brick.
5. Use a brick set or power saw to trim brick to size.
6. Fill joints in sand set brick with fine, dry sand.
7. Prepare a site as required to receive brick set in mortar.
8. Mix mortar and lay brick.
9. Clean brick of excess mortar, clean up tools and job site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate safe use of a masonry saw.
2. Review restrictions governing the scope of a masonry project which can be undertaken under a landscape license.
3. Present types of brick used in hardscape features, i.e., pavers, veneers, adobes, various ornamentals, etc., and suggest appropriate uses.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Bricks, mortar, hose, shovel, wheelbarrow, water source, sand.
2. Brickset, bricksaw, tamper, trowel, level, grout bag, sponges, water bucket.
3. Framing lumber, fasteners, hand tools if/as required.

RESOURCES:

HOW TO BUILD DECKS AND PATIOS, Ortho Books, Consumer Products Division, San Francisco, CA., 1984.

GARDEN CONSTRUCTION KNOW HOW, Ortho Books, Consumer Products Division, San Francisco, CA., 1984.

10.0 **COMPETENCY/SKILL:** Installs hardscape features.

10.6 **TASK:** Lays flagstone.

PERFORMANCE OBJECTIVES:

CONDITIONS: Given a flagstone hardscape feature to install, necessary tools and supplies,

EVALUATION: lays flagstone.

STANDARD: Stones will be laid level on a prepared surface, trimmed to reflect minimum waste and joints will be grouted and cleaned or filled with appropriate complement.

STUDENT LEARNING EXPERIENCES:

1. Estimate the quantity of flagstone required to complete a given hardscape feature.
2. List the steps necessary to install flagstone over sand and mortared flagstone, and discuss appropriate use of each system.
3. Prepare a site as required to receive sand set flagstone.
4. Use a brick set to trim stones to size.
5. Fill joints in sand set flagstone with appropriate complement.
6. Prepare a site as required to receive flagstone set in mortar.
7. Mix mortar and lay flagstone.
8. Clean stones of excess mortar, clean up tools and job site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review potential and appropriate uses of flagstone in the landscape.
2. Demonstrate safe use of a brick set for trimming stone.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Flagstone, mortar, hose, shovel wheelbarrow, water source, sand.
2. Brick set, tamper, hammer, trowel, level, grout bag, sponges, water bucket.
3. Framing lumber, fasteners, hand tools if/as required.

RESOURCES:

HOW TO BUILD DECKS AND PATIOS, Ortho Books, Consumer Products Division, San Francisco, CA., 1984.

GARDEN CONSTRUCTION KNOW HOW, Ortho Books, Consumer Products Division, San Francisco, CA., 1984.

10.0 **COMPETENCY/SKILL:** Constructs hardscape features.

10.7 **TASK:** Cuts and sets ties and poles.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape with poles and ties to be installed and appropriate tools,

EVALUATION: cuts and sets ties and poles.

STANDARD: Poles and ties will be set level, trimmed to produce minimum waste and securely embedded in the earth and/or fastened to each other.

STUDENT LEARNING EXPERIENCES:

1. List safe operating procedures for using a chain saw.
2. List the necessary steps in constructing a railroad tie retaining wall.
3. Excavate trenches for poles and ties.
4. Prepare a chain saw for use according to manufacturer's instructions.
5. Use a chain saw to trim poles and ties.
6. Use an electric drill to pre-drill holes for fasteners.
7. Use a ten pound hammer and spikes to join ties as required.
8. Backfill excavations, clean up tools, equipment, and job site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate proper preparation of a chain saw for use, i.e., preparation of fuel mix, checking for bar oil, inspecting and adjusting chain tension.

2. Demonstrate safe operation of a chain saw.

3. Describe the functions of deadmen, weepholes, and staggered joints in tie wall construction.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Railroad ties, poles, and fasteners.

2. Chainsaw, fuel, bar oil, extra chain, eye protectors.

3. Pick, shovels, wheelbarrow, electric drill, bit, extention cord, power source, 10 lb. hammer, maul.

RESOURCES:

GARDEN CONSTRUCTION KNOW HOW, Ortho Books, Consumer Products Division, San Francisco, CA., 1984.

10.0 **COMPETENCY/SKILL:** Constructs hardscape features.

10.8 **TASK:** Stuccoes walls.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a completed block wall, mortar, and necessary tools,

EVALUATION: stuccoes walls.

STANDARD: Mortar will be mixed to proper consistency and be finished with appropriate texture.

STUDENT LEARNING EXPERIENCES:

1. Determine the required amount of mortar to stucco a given wall.
2. Prepare mortar mix.
3. Use a trowel to apply and texture mortar.
4. Clean up tools and job site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the use of a trowel to texture or smooth finish stucco coating.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Mortar mix, hose, wheelbarrow, shovel, rubber gloves, water source.
2. Electric drill, mixing paddle, extension cord, power source, clean buckets.

RESOURCES:

10.9 **TASK:** Selects, mixes, and applies paint to hardscape features.

PERFORMANCE OBJECTIVE:

CONDITIONS:	Given completed hardscape features to be painted and appropriate tools,
EVALUATION:	selects, mixes, and applies paint to hardscape features
STANDARD:	Appropriate type and quantity of paint will be selected; application will be thorough, uniform, and with minimum of overspray or slop.

STUDENT LEARNING EXPERIENCES:

1. Differentiate between the types of paints, stains, and preservatives commonly applied to hardscape features.
2. Estimate the quantity of paint required to complete a given hardscape feature from manufacturer's suggested application rates.
3. Prepare hardscape features to accept paint.
4. Protect adjacent structures from paint spray with paper and tape if/as needed.
5. Mix and apply selected paints by brush or roller.
6. Use an airless paint sprayer to apply paint to stucco walls if/as required.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the set up and use of an airless sprayer according to manufacturer's directions.
2. Review the probable consequences of not protecting wooden hardscapes with sealer, paint, or stain given the extremes of Arizona's climate.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Paint, stain, or sealer; solvents, brushes, rollers, cloths, mixing paddles, as required.
2. Masking tape and protective paper.
3. Airless spray gun, extension cord, power source.

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded.)

11.1 **TASK:** Identifies and corrects plant nutrient deficiencies.

PERFORMANCE OBJECTIVE:

See Tasks 3.1, 3.2, 3.3

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded.)

11.2 **TASK:** Applies fertilizers and soil conditioners for optimum plant growth.

PERFORMANCE OBJECTIVE:

See Tasks 3.2, 3.3

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscape (turf excluded).

11.3 **TASK:** Identifies landscape maintenance tools by name and function.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a selection of landscape maintenance tools,

EVALUATION: identifies landscape maintenance tools by name and function.

STANDARD: Tools will be properly identified and their usage correctly described.

STUDENT LEARNING EXPERIENCES:

1. Visit a garden center and list the types of rakes, shovels, picks, hoes, pruners, lopers, trowels, forks, saws, shears, blowers and brooms, locally available.
2. Differentiate between the specific uses of types of shovels, rakes, picks, hoes, pruners, lopers, hoes, and forks.
3. Prepare a practical list of tools to be carried in a landscape maintenance truck, including the tools needed to maintain tools.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Display and describe the functions of less frequently needed but useful maintenance tools such as post hole diggers, augers, mauls, pry bars, swoes (hoe), bill hooks, grass whips, post setters, belts, chains, cleats, knives, etc.

2. Discuss the prbable consequences of using improper tools or tools improperly to perform a task, i.e., breakage and damage to tool, safety hazards to operator, and inefficient use of time on the job.

3. Demonstrate proper methods of cleaning and sharpening hand tools.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. An assortment of hand tools commonly used in landscape maintenance.

2. Manufacturer's catalogs describing maintenance tools and intended functions.

RESOURCES:

HOW TO SELECT AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, Consumer Products Division, San Francisco, CA., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 5, 9, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit F, 1-2, Vocational Instructional Services, College Station, TX., 1985.

11.0 **COMPETENCY/SKILL:** Maintains exterior landscape (turf excluded).

11.4 **TASK:** Prunes trees and shrubs according to approved guidelines.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an installed landscape and proper tools,

EVALUATION: prunes trees and shrubs according to approved guidelines.

STANDARD: Pruning will serve functional or ornamental needs of the landscape and be accomplished in a manner which promotes maximum health of the plant material pruned.

STUDENT LEARNING EXPERIENCES:

1. List the primary reasons why plant material is pruned.
2. Tour a local residential neighborhood and photograph landscape material which is properly pruned, improperly pruned, or would benefit from pruning.
3. Tour a landscape and list material which needs pruning to a) encourage fresh growth; b) prevent damage to itself or adjacent structures; c) encourage health by removing dead or diseased material; d) maintain a desired ornamental effect.
4. Select the proper hand tools and prune native material to encourage growth and health.
5. Select the proper hand tools and prune ornamental material to achieve a desired effect.
6. Use climbing equipment and trim palm trees if/as required.
7. Use a pole pruner to thin out top fruit bearing trees if/as required.
8. Prune your own home landscape if/as appropriate; take before and after pictures and review results.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the main benefits of pruning in a landscape.
2. Demonstrate proper pruning techniques with respect to tool selection, an understanding of the basic structure of the plant, and a sensitivity to ornamental form.
3. Indicate probable effects of the environment on plants pruned out of season.
4. Discuss practical differences between "production" pruning of large commercial projects, and "hand" pruning of pampered material to suggest ways production work can be improved and hand work make more time effective.
5. Review the particular pruning requirements and guidelines to follow in pruning the "native", arid, or xeristic (low water requiring), landscape.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. A landscape with materials to be pruned.
2. Hand pruners, shears, lopers, saws and pole pruner.
3. A tarp on which to accumulate debris, rakes, garbage container.

RESOURCES:

ALL ABOUT PRUNING, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., pp. 73-76, 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N, 8, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 8, Vocational Instructional Services, College Station, TX., 1985.

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.5 **TASK:** Stakes and ties trees to obtain desired growth.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape with younger trees,

EVALUATION: stakes and ties trees to obtain desired growth.

STANDARD: Stakes or anchors will be of the size specified for the caliper of tree to be staked and installed to recommended depth; ties selected will be attached in a manner which does not restrict growth.

STUDENT LEARNING EXPERIENCES:

1. Determine if/as appropriate prevalent wind direction on site where trees are to be staked.
2. Use a fence post setter or 10 lb. hammer to set two stakes per tree.
3. Select and install appropriate padded wire or rubber tree ties.
4. Use a maul or 10 lb. hammer to set "Duckbill" type tree anchors according to manufacturer's recommendations. Install and wire ties.
5. Inspect guyed or staked trees on an existing landscape and adjust or remove ties as required.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the probable consequences of improper staking and tying of trees.
2. Point out, if available, trees in the process of dying or being severely damaged by constricting ties.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Stakes, tree ties, earth anchors.
2. Post setter, sledge, pliers.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., pp. 68-72, 1981

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.6 **TASK:** Selects, mixes, and applies preemergence herbicides to prevent weed growth.

PERFORMANCE OBJECTIVE:

See Tasks 2.11, 3.3, 3.4, 3.5

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.7 **TASK:** Identifies annual and perennial weeds.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape and a guide to common weeds,

EVALUATION: identifies annual and perennial weeds.

STANDARD: Common weeds will be accurately identfied by common and botannical name and classified by annual or perennial habit.

STUDENT LEARNING EXPERIENCES:

1. List characteristics used to "key out" identity of a weed.
2. Obtain a list of weeds most commonly encountered in your area and suggested controls from the County Extention Agent.
3. Tour a local residential or commercial landscape and identify and list seasonal and perennial weeds.
4. Differentiate between the habits of annual and perennial weeds and suggest appropriate controls.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate how unknown weeds can be keyed out on site.
2. Present slides or samples of commonly encountered weeds.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Weed identification materials.
2. Samples or slides of commonly encountered weeds.

RESOURCES:

ALL ABOUT LAWNS, Ortho Books, Chevron Chemical Company, Consumer Products Division, San Francisco, CA., 1984.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., pp. 48-49, 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit H, 5, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115C, Unit G, 8, Vocational Instructional Services, College Station, TX., 1985.

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.8 **TASK:** Selects, mixes and applies contact herbicides to control annual weeds.

PERFORMANCE OBJECTIVE:

See Tasks 2.11, 3.3, 3.4, 3.5

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.9 **TASK:** Selects, mixes, and applies systems herbicides to control perennial weeds.

PERFORMANCE OBJECTIVE:

See Tasks 2.11, 3.3, 3.4, 3.5

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

177

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.10 **TASK:** Selects, mixes, and applies insecticides to control insect pests.

PERFORMANCE OBJECTIVE:

See Tasks 2.12, 3.3, 3.4, 3.5

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.11 **TASK:** Identifies and controls diseases of landscape plants.

PERFORMANCE OBJECTIVE:

See Tasks 2.13, 3.3, 3.4, 3.5

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.12 **TASK:** Waters plants for optimum growth.

PERFORMANCE OBJECTIVE:

See Tasks 6.1, 6.2

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

11.0 **COMPETENCY/SKILL:** Maintains exterior landscapes (turf excluded).

11.13 **TASK:** Operates and maintains chain saws, electric hedge shears, and blowers.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given selected power equipment, operating manuals, and hand tools,

EVALUATION: operates and maintains chain saws, electric hedge shears, and blowers.

STANDARD: Tools will be operated safely and routine maintenance measures will be performed before and after use.

STUDENT LEARNING EXPERIENCES:

1. Inspect a chain saw air filter and clean as required.
2. Inspect a chain saw guidebar, clean channel and flatten rails if/as required.
3. Remove guide bar and install chain.
4. Adjust chain to recommended tension.
5. Use files and depth gauge jointer to manually sharpen chain.
6. Inspect chain oil resevoir and add oil if required.
7. Measure and prepare fuel mix according to manufacturer's specifications.
8. List the safety precautions to be taken when operating a chain saw.
9. Start the chain saw following manufacturer's instructions.
10. Troubleshoot a balky engine by checking fuel vent, fuel line, fuel filter, air filter, spark plug, spark plug wire, choke, fuel mix, kill switch, and points.
11. Operate chain saw according to manufacturer's instructions and prune tree limbs according to guidelines.
12. Prepare saw for storage by cleaning off debris and draining fuel mix.
13. Inspect and remove debris from blades of electric hedge trimmer.
14. Inspect cutting blades and replace if worn.

15. Inspect shear for loose nuts or screws and tighten if required.

16. Operate electric shear according to manufacturer's instructions.

17. Inspect a blower air filter and clean as required.

18. Measure and prepare fuel mix according to manufacturer's recommendations.

19. Employ proper safety equipment while operating blower.

20. Adjust carburetor needle valves for high and low range according to manufacturer's recommendations.

21. Troubleshoot balky engine and repair or replace parts as required.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss problem of chain saw kickback and demonstrate proper use of saw.

2. Discuss necessity of frequent filter inspection given Arizona's dusty conditions.

3. Demonstrate proper use of hedgeshears.

4. Present OSHA acceptable ear protection devices.

5. Review the steps in trouble shooting and field repair of chain saw and blower engines.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Chain saw, blower, electric hedge shears, power cord, power source, fuel mix, bar oil, cloths, screwdrives, socket wrenches, pliers.

RESOURCES:

HOW TO SELECT, MAINTAIN, AND USE GARDEN EQUIPMENT, Ortho Books, Consumer Products Division, San Francisco, CA., 1984.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit O, 1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit E, 2, 3, 4, F, 2, Vocational Instructional Services, College Station, TX., 1985.

182

12.0 **COMPETENCY/SKILL:** Maintains interior landscapes.

12.1 **TASK:** Identifies interior plants by common and botanical names.

PERFORMANCE OBJECTIVES:

CONDITIONS: Given a broad selection of commonly used interior plant material, or slides or pictures of interior plant material.

EVALUATION: identifies interior plants by common and botanical names.

STANDARD: Plants will be accurately identified and names spelled correctly.

STUDENT LEARNING EXPERIENCES:

1. Tour a mall or business plaza and use a picture reference quide to identify plants by common and botannical names.
2. Visit a greenhouse specializing in interior plants and identify plants by common and botanical names.
3. Select and list plant material suitable for interior landscaping from a nurseryman's catalog.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the basics of plant taxonomy as a system of identification.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Broad selection of locally used interior plant material, a pre-selected site containing such a selection, or pictures.
2. Illustrated catalogs from major nurseries such as Hines, Monrovia, or Bordiers.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT. #31A, Unit L4, Vocational Instructional Services, College Station, TX. 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT. #115A, Unit D6, Vocational Instructional Services, College Station, TX. 1985.

INTERIOR LANDSCAPING, Prentice-Hall, Englewood Cliffs, NJ. available through Ohio Aricultural Curriculum Materials Service, The Ohio State University, Columbus, OH., 1983.

12.0 **COMPETENCY/SKILL:** Maintains interior landscapes.

12.2 **TASK:** Locates interior plants by light requirements.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a sketch of an interior to be landscaped with light sources identified, and a list of plant material,

EVALUATION: locates interior plants by light requirements.

STANDARD: Appropriate plants will be chosen for the light conditions available.

STUDENT LEARNING EXPERIENCES:

1. Visit an interior landscape and compare to growth habits and appearance of plants receiving appropriate light with plants improperly located.
2. Use a meter to determine actual available light in various locations of an interior landscape.
3. Select and locate appropriate plant material on an interior landscape plan.
4. List steps necessary to condition nursery grown material for indoor landscaping.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present a guest speaker from the interior plant maintenance trade.
2. Discuss reasons and techniques used to condition nursery grown plants prior to placing them in an interior landscape.
3. Discuss the probable consequences of using unconditioned plants or plants placed in the wrong light levels in the interior plantscape.
4. Compare two basic approaches to interior plantscaping: straight maintenance of owner supplied material, and lease/maintenance agreements.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. An interior landscape plan.
2. Light meter.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT. #31A, Unit L4, Vocational Instructional Services, College Station, TX. 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT. #115A, Unit D6, Vocational Instructional Services, College Station, TX. 1985.

INTERIOR LANDSCAPING, Prentice-Hall, Englewood Cliffs, NJ. available through Ohio Aricultural Curriculum Materials Service, The Ohio State University, Columbus, OH., 1983.

12.0 **COMPETENCY/SKILL:** Maintains interior landscapes.

12.3 **TASK:** Cleans plant leaves.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an interior plantscape or interior plants and cleaning materials,

EVALUATION: cleans plant leaves.

STANDARD: Leaves will be cleaned without damage to the plant.

STUDENT LEARNING EXPERIENCES:

1. Select and mix leaf cleaning solution according to manufacturer's instructions.
2. Use a soft cloth or sponge to clean leaves without breaking or bruising them.
3. List the practical and functional reasons why plant leaves are cleaned in the interior landscape.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate proper cleaning of plants without breaking leaves.
2. Review probable consequences of using improperly chosen or mixed cleaning solutions.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Plant cleaning solution, water, buckets, sponges or soft cloths.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT. #31A, Unit L4, Vocational Instructional Services, College Station, TX. 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT. #115A, Unit D6, Vocational Instructional Services, College Station, TX. 1985.

INTERIOR LANDSCAPING, Prentice-Hall, Englewood Cliffs, NJ. available through Ohio Aricultural Curriculum Materials Service, The Ohio State University, Columbus, OH., 1983.

12.0 **COMPETENCY/SKILL:** Maintains interior landscape.

12.4 **TASK:** Identifies and controls diseases and insect pests of interior plants.

PERFORMANCE OBJECTIVE:

See Tasks 2.11, 2.12, 3.3, 3.4, 3.5

CONDITIONS:

EVALUATION

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS AND SUPPLIES:

RESOURCES:

12.0 **COMPETENCY/SKILL:** Maintains interior landscape.

12.5 **TASK:** Waters and fertilizes interior plants for optimum growth

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an interior landscape to be maintained, materials and supplies,

EVALUATION: waters and fertilizes interior plants for optimum growth.

STANDARD: Plants will be watered and fertilized so that water stress is minimized and plants remain in active growth.

STUDENT LEARNING EXPERIENCES:

1. Select and use appropriate length hose extentions (water wands) to water over head plants.
2. Use a tensiometer to determine water needs of containerized plants.
3. Drain saucers if/as required after watering indoor plants.
4. List visible signs of water stress in indoor plants.
5. Use a Solubridge meter to determine the level of salts in container growing media.
6. Leach indoor plants if/as necessary.
7. Compare, select, and apply fertilizer to an interior landscape at manufacturer's selected rate.
8. Clean up water spills on the job.
9. Develop a checklist of tools and supplies to be taken on an interior plant maintenance job.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the use and interpretation of a tensiometers and Solubridge type meters.
2. Discuss the advantages of using slow release, "osmocote" type fertilizers in interior landscape.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. An interior landscape or interior plants to be maintained.
2. Fertilizers and sample fertilizer analyses.
3. Hose, breakers, water wands, water source, watering can, pump sprayer, extentions, mop, cloths.
4. Solubridge meter, tensiometer, soil test kit.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT. #31A, Unit L4, Vocational Instructional Services, College Station, TX. 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT. #115A, Unit D6, Vocational Instructional Services, College Station, TX. 1985.

INTERIOR LANDSCAPING, Prentice-Hall, Englewood Cliffs, NJ. available through Ohio Aricultural Curriculum Materials Service, The Ohio State University, Columbus, OH., 1983.

12.6 **TASK:** Replaces interior plants.

PERFORMANCE OBJECTIVE:

CONDITIONS:	Given an interior landscape to maintain, replacement plant material, tools, and supplies,
EVALUATION:	replaces interior plants.
STANDARD:	Plants in need of replacement will be correctly identified, conditions causing deterioration will be determined and corrected, and appropriate replacements will be selected and properly planted.

STUDENT LEARNING EXPERIENCES:

1. List commonly encountered conditions which cause indoor plants to deteriorate or die.
2. Inspect an interior landscape and identify plants in need of replacement; determine whether they should be replaced with a similar or different variety.
3. Correct soil, drainage, insect, disease, or fertility problems as encountered.
4. Install replacement plants according to guidelines.
5. Restore planters to finished condition and clean up the job site.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Describe visual clues which may serve as early indications of interior landscape problems.

2. Demonstrate the proper removal of plants from containers.

3. Review the responsibility of the interior maintenance person to suggest alternative varieties when interior conditions cannot be manipulated.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. An interior landscape to be maintained and replacement plants.

2. Trowels, shovels, hose, water source, broom, mop, trash containers.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT. #31A, Unit L4, Vocational Instructional Services, College Station, TX. 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT. #115A, Unit D6, Vocational Instructional Services, College Station, TX. 1985.

INTERIOR LANDSCAPING, Prentice-Hall, Englewood Cliffs, NJ. available through Ohio Aricultural Curriculum Materials Service, The Ohio State University, Columbus, OH., 1983.

12.7 **TASK:** Trims interior plants for optimum growth and appearance.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given interior plants to maintain, and the necessary hand tools,

EVALUATION: trims interior plants for optimum growth and appearance.

STANDARD: All dead, dying, and diseased plant material will be removed, incidental debris and leaf drop will be removed from planters or containers.

STUDENT LEARNING EXPERIENCES:

1. Use scissors, pruners, or lopers as required to remove dead, dying, or diseased material from interior plants.
2. Prepare a sterilizing solution and clean hand tools between cuts if disease is identified or suspected.
3. Thin plant material with hand tools to encourage air circulation if/as required.
4. Prune indoor trees to shape, contain, or encourage new growth.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Relate the intention and frequently perceived benefits of interior landscaping to the role of the interior landscape maintenance person.
2. Demonstrate proper thinning and pruning of interior plants.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Scissors, pruners, lopers, rake, bleach, water, water source, bucket, trash containers, broom.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT. #31A, Unit L4, Vocational Instructional Services, College Station, TX. 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT. #115A, Unit D6, Vocational Instructional Services, College Station, TX. 1985.

INTERIOR LANDSCAPING, Prentice-Hall, Englewood Cliffs, NJ. available through Ohio Aricultural Curriculum Materials Service, The Ohio State University, Columbus, OH., 1983.

13.0 **COMPETENCY/SKILL:** Installs residential and commercial turf areas.

13.1 **TASK:** Identifies turf species commonly used in the local area.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given local climate conditions,

EVALUATION: identifies turf species commonly used in the local area.

STANDARD: Species identified will be appropriate for local conditions.

STUDENT LEARNING EXPERIENCES:

1. List the environmental factors which determine the suitability of turf species to a given area.
2. Review County Extention Agent recommendations of suitable turf species.
3. Call a local sod farm to determine varieties of turf available from sod or stolons.
4. Compare and contrast the physical characteristics of common and hybrid Bermuda varieties.
5. Compare and contrast the physical characteristics of annual and perennial rye grasses.
6. Prepare an irrigated test plot and compare the effects of local conditions on less commonly used grasses such as zoysia, buffalo grass, and hybrid fescues.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Differentiate between common and hybrid turf varieties.
2. Discuss reasons why blended perennial ryes, blue grasses, or fescues may be preferable to single species.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. County Extension recommendations of suitable turf species.
2. Descriptive literature from sod farms and seed hybridizers.

RESOURCES:

ARIZONA CERTIFIED PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ. p. 49. 1981.

13.0 **COMPETENCY/SKILL:** Installs residential and commercial turf areas.

13.2 **TASK:** Identifies characteristics of turf species.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a listing of potential turf choices and descriptive information,

EVALUATION: identifies characteristic of turf species.

STANDARD: Characteristics will be accurately matched to the varieties of turf species.

STUDENT LEARNING EXPERIENCES:

1. Identify locally used turf species which are shade tolerant.
2. Identify locally used turf species which are traffic tolerant.
3. Compare locally used turf species for disease resistance.
4. Compare the relative water requirements of locally used turf species.
5. Compare the relative amount of maintenance required by locally used turf species.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss ways in which turf species and turf substitutes may be used in a water conserving fashion, including selecting drought resistant grasses, limiting the size of an installation, living with a dormant lawn for portions of the year, and using ground covers such as myoporum or lantana to substitute for portions of an intended turf area.

2. Identify local regulations which limit or reward the self-limiting of turf installations.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Descriptive literature detailing the characteristics of locally used turf species.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., pp. 49, 1981.

ALL ABOUT LAWNS AND GROUND COVERS, Ortho Books, Chevron Chemicals Company, Consumer Products Division, San Francisco, CA., 1983.

STUDENT REFERENCE ON TURF MANAGEMENT, Specialized Curriculum in Horticulture, Student Reference Number Seven, Department of Agricultural Education, University of Arizona, Tucson, AZ., 1971.

13.0 **COMPETENCY/SKILL:** Installs residential and commercial turf areas.

13.3 **TASK:** Selects appropriate turf species.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a local area where turf is to be installed, a description of light conditions, and a description of intended use,

EVALUATION: selects appropriate turf species.

STANDARD: Species selected will be successful in local conditions, specific light conditions, and be suitable for intended usage.

STUDENT LEARNING EXPERIENCES:

1. Select an appropriate turf species for a residential client who will be gone all summer, and won't be able to take care of it.
2. Select an appropriate turf species for a residential client who wants to reseed a shady spot under some high crowned trees.
3. Select an appropriate turf species for a sunny residential backyard where the owners would like to play croquet.
4. Select an appropriate turf species for a sunny front yard which is informally landscaped.
5. Select an appropriate turf species for a sunny back yard where the owners' children will be playing with their dogs.
6. Select an appropriate turf species for a residential client who is worried about allergies and doesn't want to do much maintenance.
7. Select an appropriate turf species for a residential client who has a formally landscaped, sunny front yard, and intends to hire a service to keep it maintained.
8. Select a turf species for the common areas of a condominium project where traffic will be moderate and the owners want to keep the water bills down.
9. Select a turf species for the shaded courtyard of a commercial office building.
10. Select a turf species for a commercial project's water retention area, that gets plenty of sun, but may have to tolerate occasional standing water.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss practical reasons why turf selection frequently involves compromise, i.e., environmental conditions may be too harsh to support a year around green lawn; or a given installation may have areas that blend from sun to semi-shade, to shade and required a turf that handles most of it reasonably well, if none of it perfectly, etc.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Descriptive literature detailing the characteristices of locally used turf species.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., pp. 49, 1981.

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agriculture University of Arizona, Tucson, AZ., 1971.

13.0 **COMPETENCY/SKILL:** Installs residential and commercial turf areas.

13.4 **TASK:** Installs turf using sod, stolons, plugs or seed.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a prepared and irrigated area where turf is to be installed, tools, and supplies,

EVALUATION: installs turf using sod, stolons, plugs or seed.

STANDARD: Area will be finish raked prior to installation, stolons or seed will be raked in and top dressed with mulch, plugs will be spaced uniformly on center, and sod, stolons, and seed will be rolled level.

STUDENT LEARNING EXPERIENCES:

1. List the steps necessary to prepare a turf area.
2. Use a formula to determine the quantity of mulch necessary to ammend the soil in a given turf area.
3. Use a formula to determine the quantity of mulch necessary to top dress a given turf area to slow water loss.
4. List the proper times of the year to start turf from seed, stolons, plugs or sod in your location.
5. Calculate the required amount of seed, sod, stolons or plugs needed to cover a given sod area.
6. Calculate the relative costs per square foot to install seed, stolons, plugs and sod.
7. Partially fill a water ballast roller with water.
8. Rake, sow, cover with mulch, and roll a turf area.
9. Rake, distribute stolons, cover with mulch, and roll a turf area.
10. Cut uniform plugs from a roll or flat of zoysia grass, dichondra, or St. Augustine and plant on center in a turf area.
11. Lay and roll sod.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the adviseability of removing any visible weeds by hand prior to installing turf.

2. Discuss, from a practical standpoint why, when a sizeable area is to be seeded and visible weeds are a problem, it might make sense to postpone the projects until the problem is controlled by a combination spray of Roundup and Surflan.

3. Discuss the probable benefits to watering an area to receive turf a day or two in advance of installation.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Seed, stolons, sod, or plug material; mulch.

2. Cyclone spreader, or Whirlybird, rakes, roller, knive with replaceable blades, wheelbarrow, trowels.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ. p. 49. 1981.

ALL ABOUT LAWNS AND GROUNDCOVERS, Ortho Books, Chevron Chem Company, Consumer Products Division, San Francisco, CA. 1983.

13.0 **COMPETENCY/SKILL:** Installs residential and commercial turf areas.

13.5 **TASK:** Irrigates newly installed turf for optimum growth.

PERFORMANCE OBJECTIVE:

See Tasks 5.8, 6.1, 6.2

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.1 **TASK:** Applies fertilizers and soil conditioners for optimum turf growth.

PERFORMANCE OBJECTIVE:

See Tasks 2.1, 3.1, 3.2, 3.3

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.2 **TASK:** Identifies and controls common turf insects.

PERFORMANCE OBJECTIVE:

See Tasks 2.12, 3.2, 3.3, 3.4, 3.5

CONDITIONS: Given an area of turf to be maintained, appropriate chemical controls and application device,

EVALUATION: identifies and controls common turf insects.

STANDARD: Insects will be correctly identified and proper controls applied.

STUDENT LEARNING EXPERIENCES

1. Identify the characteristics of pearl scale and pearl scale damage.
2. Select and apply appropriate pearl scale controls.
3. Identify the characteristics of Rhodegrass scale and Bermudagrass (Ruth) scale.
4. Select and apply appropriate scale controls.
5. Identify the characteristics of bermuda mites.
6. Select and apply appropriate mite controls.
7. Identify the characteristics of sod webworms.
8. Select and apply appropriate sod webworm controls.
9. Identify the characteristics of leafhoppers.
10. Select and apply appropriate leafhopper controls.
11. Identify the characteristics of leaf hoppers.
12. Select and apply leaf hopper controls.
13. Design a schedule for regular spraying to prevent insect infestations in turf.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Compare and contrast the uses of Malathion, Diazinon, and Dursban in preventative programs.
2. Review current recommendations for the use of OFTANOL (1 methylethly 2 ethoxy 1 methylethyl 1 amino phosphinothioyl 1 oxy benzonate, 1.5%, 3lbs. per 1,000 sq. ft.), as the best new control of pearl scale.
3. Discuss hazards of long term exposure to insecticides in the context of reviewing safety equipment and safe application procedures.
4. Review immediate first aid steps to be taken in the event of accidental contact with insecticides.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Liquid and granular insecticides; application equipment.
2. Protective clothing, gloves, masks, respirators.

RESOURCES:

ALL ABOUT LAWNS, Ortho Books, San Francisco, CA., 1983.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Phoenix, Arizona Nursery Association, 1981.

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, University of Arizona, Tucson, AZ., 1971.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.3 **TASK:** Identifies and controls common turf weeds.

PERFORMANCE OBJECTIVE:

See tasks 2.11, 3.2, 3.3, 3.4, 3.5, 10.8

CONDITIONS: Given a turf area to be maintained, appropriate chemical controls, and application equipment,

EVALUATION: identifies and controls common turf weeds.

STANDARD: Common weeds will be correctly identified and appropriate controls will be applied.

STUDENT LEARNING EXPERIENCES

1. List commonly available chemicals to control broad leaf weeds in turf grasses.
2. List commonly available chemicals to control grasses in broad leaf turfs.
3. Identify common broad leaf weeds found in local turf grasses and apply appropriate controls.
4. Identify common weeds found in dichondra and lippia turf and apply appropriate controls.
5. List environmental factors which will effect the success or failure of a weed control program.
6. Prepare a preventative weed control program for a turf area.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the wide variety of costs and actual ounces of chemical in similar "name brand", "local brand" and "generic" packaging as it relates to profitable maintenance operations.
2. Discuss the probable consequences of drift or wind drift when applying contact and systemic herbicides.
3. Compare the pro's and con's of using "weed and feed" and fertilizers with a preemergence control such as Dacthal in residential and commercial maintenance programs.
4. Discuss the current use of "POAST" to control grasses in broad leaf turf and ground cover.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Selection of weed control chemicals and applicators.
2. Weed control labels and manufacturer's suggested application rates.

RESOURCES:

ALL ABOUT LAWNS AND GROUND COVERS, Ortho Books, San Francisco, CA., 1983.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, University of Arizona, Tucson, AZ., 1971.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.4 **TASK:** Identifies and controls common turf diseases.

PERFORMANCE OBJECTIVE:

See Tasks 2.13, 3.3, 3.4, 3.5

CONDITIONS: Given a turf area to be maintained, appropriate chemical controls, and application equipment,

EVALUATION: identifiers and controls common turf diseases.

STANDARD: Common diseases will be correctly identified and appropriate controls will be applied.

STUDENT LEARNING EXPERIENCES

1. Identify environmental factors conducive to turf disease.
2. List the cultural practices most likely to prevent turf disease.
3. Identify the visual characteristics of melting out, brown patch, greasy spot, fusarium, seedling blight and list appropriate chemical controls.
4. Apply chemical disease controls according to manufacturer's recommendations.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the relationship between watering practices and common turf diseases.
2. Discuss the role of aerating, verticutting, and dethatching in the prevention of turf disease.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Chemical turf disease controls, applicators.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, The University of Arizona, Tucson, AZ., 1971.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.5 **TASK:** Mows turf to optimum height using a rotary mower.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an area of turf to be maintained and necessary equipment and hand tools.

EVALUATION: mows turf to optimum height using a rotary mower.

STANDARD: Equipment will be adjusted to proper height for turf species and turf will be mowed without skips or excessive overlap.

STUDENT LEARNING EXPERIENCES:

1. Identify optimum heights of commonly encountered turf species.
2. Adjust rotary mower to desired height following manufacturer's instructions.
3. Inspect oil reservoir and fuel level of mower and add as necessary.
4. Inspect and clean air filter as necessary.
5. List safety precautions to be followed when operating a rotary mower.
6. Start mower and adjust to recommended operating speed.
7. Troubleshoot a balky engine by checking fuel vent, fuel line, fuel filter, fuel mix, spark plug, spark plug wire, kill switch, and choke.
8. Prepare mower for storage by cleaning off debris and cleaning grass from underbody of deck.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the basic desirable characteristics in a commercial rotary mower, i.e., check durability, ease of maintenance, availability of parts and service, etc.
2. Discuss the pro's and con's of self propelled mowers.
3. Distribute manufacturer's literature as available and review appropriate uses for specialized rotary mowers including narrow deck, wide deck, garden tractor and other riding types.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Rotary mower, fuel, oil, cloths, trash container.
2. Socket wrenches, screwdriver, crescent wrenches.

RESOURCES:

HOW TO SELECT, USE AND MAINTAIN GARDENT EQUIPMENT, Ortho Books, San Francisco, CA., 1981.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit 0.2, Vocational Instructional Services, College Station, Texas, 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, Cat #115A, Unit D.3, G.8, Vocational Instructional Services, College station, Texas, 1985.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.6 **TASK:** Mows turf to optimum height using a reel-type mower.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an area to turf to be maintained and necessary equipment and hand tools,

EVALUATION: mows turf to optimum height using a reel-type mower.

STANDARD: Equipment will be adjusted to proper height for turf species and turf will be mowed without skips or excessive overlap.

STUDENT LEARNING EXPERIENCES

1. Compare the advantages and disadvantages of reel-type and rotary mowers.
2. Identify optimum heights of commonly encountered turf species.
3. Remove rocks or noticeable debris from area to be mowed.
4. Adjust mower to desired height following manufacturer's instructions.
5. Inspect and adjust the bed knife if necessary.
6. Inspect oil reservoir and fuel level of mower and add as necessary.
7. Inspect and clean air filter.
8. Start mower and adjust engine to recommended operating speed.
9. Troubleshoot a balky engine by checking fuel vent, fuel line, fuel filter, fuel mix, spark plug, spark plug wire, kill switch, and choke.
10. Mow turf area in two right angle passes.
11. Clean mower of clippings and debris; wipe down blades with oily cloth.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Identify the desirable characteristics of a commercial reel-type mower.

2. Discuss the range of potential applications for reel-type mowers from practical and quality viewpoints.

3. Distribute manufacturer's literature as available and review range of reel-type mowers from push types through tractor drawn gang mowers.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Reel-type mower, fuel, cloths, oil, trash container.

2. Socket wrenches, screwdriver, crescent wrenches.

RESOURCES:

HOW TO SELECT, USE AND MAINTAIN GARDEN EQUIPMENT. Ortho Books, San Francisco, CA., 1983.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, 1981.

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, University of Arizona, Tucson, AZ., 1971.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT # 31A, Unit 0.2, Vocational Instructional Services, College Station, Texas, 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115A, Unit D.3, Vocational Instructional SErvices, College Station, Texas, 1985.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.7 **TASK:** Irrigates turf for maximum growth.

PERFORMANCE OBJECTIVES:

See Tasks 6.1, 6.2, 6.3

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.8 **TASK:** Operates a string trimmer.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an area of turf to be maintained, a string trimmer, fuel mix, and had tools,

EVALUATION: operates a string trimmer.

STANDARD: Trimmer will be operated in a safe manner and edging or trimming will be uniform.

STUDENT LEARNING EXPERIENCES

1. Identify common practical uses of string trimmers in maintaining turf areas.
2. Install tree guards if necessary to prevent string trimmer damage.
3. Disassemble a string cutting head, reload, and reassemble according to manufacturer's instructions.
4. List items of protective clothing to be worn while operating a string trimmer.
5. Inspect and clean air filter as necessary.
6. Adjust handle for balance and operating position.
7. Start string trimmer according to manufacturer's instructions.
8. Adjust low idle and operating speed according to manufacturer's instructions if required.
9. Troubleshoot balky engine by checking fuel line, fuel filter, fuel mix, spark plug, spark plug wire, kill switch, and choke.
10. Use a string trimmer to edge a turf area along a sidewalk.
11. Use a string trimmer to edge a turf area along a wall.
12. Use a string trimmer to remove overgrowth from around sprinkler heads.
13. Use a string trimmer to edge along a mow strip.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the pro's and con's of straight shaft vs. bent shaft trimmers.
2. Demonstrate proper adjustment of low idle and operating range needle valves.
3. Demonstrate the proper use of a "bump" or automatic feed head.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. String trimmer, fuel mix, cloths, additional string.
2. Safety goggles, ear protectors.
3. Screw drivers, socket wrenches, pliers, cotter pins.

RESOURCES:

HOW TO SELECT, USE, AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, San Francisco, CA., 1983.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.9 **TASK:** Operates a power edger.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an area of turf to maintain, proper tools and equipment,

EVALUATION: operates a power edger.

STANDARD: Edger will be operated in a safe manner and edges will be uniform and straight.

STUDENT LEARNING EXPERIENCES:

1. Inspect and adjust belt tension according to manufacturer's recommendations.
2. Inspect and clean air filter as necessary.
3. Inspect oil and fuel reservoirs and add if needed.
4. Start edger according to manufacturer's recommendations and adjust throttle to operating speed.
5. Adjust edger to desired cutting depth.
6. Use an edger to desired cutting depth.
7. Clean edger of grass and dirt and wipe blade with oiled cloth.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Compare and contrast the use of edgers vs. string trimmers in residential and commercial maintenance.
2. Demonstrate proper adjustment of belt tension.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Edger, fuel, cloth, socket wrenches, crescent wrench, screwdriver.

2. Safety goggles, ear protectors.

RESOURCES:

HOW TO SELECT, USE, AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, San Francisco, CA, 1983.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT # 31A, Unit 0.1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT # 115B, Unit E. 3,5, Vocational Instructional Services, College Station, TX., 1985.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.10 **TASK:** Dethatches/verticuts turf.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an area of turf to be maintained, proper tools and equipment,

EVALUATION: dethatches/verticuts turf.

STANDARD: Equipment will be properly adjusted, and operated safely; incidental damage to turf will be minimized, and all debris raked and removed from the site.

STUDENT LEARNING EXPERIENCES:

1. Compare the process and intended benefits of verticutting and dethatching.
2. Identify species of turf which may best benefit from dethatching.
3. Identify species of turf which may best benefit from verticutting.
4. Mark sprinkler heads with flags or stakes before dethatching or verticutting.
5. Inspect and adjust belt tension on verticutter or dethatcher.
6. Inspect fuel and oil levels and add if needed.
7. Inspect and clean air filter if needed.
8. Adjust equipment to desired depth of penetration according to manufacturer's recommendations.
9. Start and adjust equipment to recommended operating speed.
10. Use a dethatcher to remove thatch from turf.
11. Use a verticutter to open overly dense turf.
12. Hand rake and bag thatch and debris.
13. Flood a small turf area to "float" additional thatch out of the turf; rake and bag.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the relationship of "thatch" to turf health, watering practices, insect control, fertilizing schedules, and overall vigor.
2. Describe the different cultural benefits derived from dethatching, verticutting, "scalping", and aerating.
3. Discuss the pro's and con's of owning vs. seasonal renting of specialized equipment.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. A Verticutter or dethatcher, fuel, socket wrenches, screwdriver, crescent wrench.
2. Protective goggles, ear protection.

RESOURCES:

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, University of Arizona, Tucson, AZ., 1971.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.11 **TASK:** Overseeds Bermuda grass lawns with winter rye.

PERFORMANCE OBJECTIVES:

CONDITIONS: Given a Bermuda grass lawn ready to be overseeded, seed, application equipment and hand tools,

EVALUATION: overseeds Bermuda grass lawns with winter rye.

STANDARD: Proper quantity of seed will be evenly distributed and irrigation system will be adjusted to promote germination of seed.

STUDENT LEARNING EXPERIENCES:

1. Compare the advantages and disadvantages of annual rye vs. perennial rye.
2. Prepare a test plot or sow separate job sites with annual and perennial rye, and observe differences in performance over time.
3. Determine the proper quantity of annual and perennial rye needed to overseed a given turf area.
4. Distribute seed with a Whirly Bird.
5. Distribute seed with a cyclone or drop spreader.
6. Topdress overseed turf with mulch.
7. Adjust irrigation timer to promote seed germination.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review factors governing water needs of winter lawns.
2. Discuss the probable consequences of over broadcast seed, and indicate why Surflan is often used at overseeding time to inhibit both winter weed and winter grass seed germination.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Annual or perennial ryegrass seed, spreader, rake, mulch.

RESOURCES:

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, University of Arizona, Tucson, AZ., 1971.

14.12 **TASK:** Performs routine maintenance on turf maintenance equipment.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given turf equipment to be maintained, tools, and supplies,

EVALUATION: performs routine maintenance on turf maintenance equipment.

STANDARD: Oil will be changed, spark plugs replaced, chains and belts adjusted, air filters cleaned, and blades sharpened as needed so the equipment being maintained is ready for use when needed.

STUDENT LEARNING EXPERIENCES:

1. Prepare a checklist for routine service of turf maintenance equipment.
2. Visually inspect turf equipment and identify items in need of maintenance.
3. Locate the drain plug on a 4 cycle (lawn mower) engine; drain and change the oil.
4. Use a grease gun to lubricate turf equipment according to manufacturer's instructions.
5. Remove, inspect, clean, gap, and replace spark plugs in turf equipment.
6. Remove, clean, re-oil, and replace air filters on turf equipment.
7. List the proper steps necessary in removing the blade from a rotary mower.
8. Remove and sharpen a rotary mower blade.
9. Use a dowel to assess the balance of a rotary mower blade and balance by filing if required.
10. Remove housings from turf maintenance equipment and clean out debris by hand or with compressed air.
11. Adjust drive belts and chains to recommended tensions on turf equipment according to manufacturer's recommendations.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the proper way to remove and sharpen a rotary mower blade.
2. Review proper storage of solvents and fuels.
3. Demonstrate proper use of socket wrenches to guard against crossthreading, shearing, or stripping.
4. Demonstrate checking for proper tension and inspection of drivebelts.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Commonly used turf maintenance equipment including mowers, trimmer, edger, dethatcher, spreaders.
2. Socket wrenches, crescent wrenches, vise, workbench, screwdrivers, hammer, Allen wrenches, sharpening tools, nut drivers, etc.
3. Grease gun, grease, fuel, oil, 2 cycle oil, WD 40, cloths.
4. Manufacturer's instructions and maintenance manuals for turf maintenance equipment.

RESOURCES:

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT # 31A, Unit 0.1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit F.3, Vocational Instructional Services, College Station, TX., 1985.

14.0 **COMPETENCY/SKILL:** Maintains residential and commercial turf areas.

14.13 **TASK:** Prepares a bid for a landscape maintenance job.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a landscape to be maintained,

EVALUATION: prepares a bid for a landscape maintenance job.

STANDARD: Bid will include consideration of weekly mowing, quarterly pruning, quarterly fertilizing, preventative weed and insect control, verticutting and overseeding, and reflect consideration of costs of materials and labor, labor burden, overhead, and anticipated percentage of profit and be acceptable if within 15% of the consensus bid.

STUDENT LEARNING EXPERIENCES:

1. Prepare a checklist of maintenance services to be performed under contract.
2. Visit a maintenance job site and list features and materials which need to be maintained.
3. Determine a fair hourly rate for maintenance labor and supervision based on local economic conditions.
4. Estimate the number of labor hours and supervisory hours needed for weekly maintenance.
5. Estimate the number of labor hours and supervisory hours needed for quarterly pruning.
6. Estimate the quantities and costs of materials needed for fertilizing, overseeding, weed and insect control.
7. Define the term "labor burden" and assign a percentage of costs.
8. List factors which constitute overhead in a landscape maintenance business, and assign a percentage of cost.
9. Determine a desired profit percentage and factor it in as a percentage of total costs.
10. Organize and present a bid for a landscape maintenance job.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Compare the pro's and con's of unit price bidding, i.e., so much per sq. ft. of turf, or linear foot of shrub bed with a more detailed cost analysis.

2. Identify maintenance items such as replacement of annual bedding plants, repair of irrigation system, replacement of shrubs and trees most often quoted outside the "bid" on a time and materials basis.

3. Discuss factors affecting the sale of a landscape maintenance contract including professional presentation, knowledge of client needs, and competitive pricing.

4. Discuss overhead factors which affect even the smallest maintenance operations including upkeep on trucks and equipment, time spent making "free estimates", bookkeeping, equipment replacement, and taxes.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Pre-selected site to serve as the basis of a bid.

2. Sample sheets for the calculation of a maintenance bid.

RESOURCES:

ESTIMATING AND MANAGEMENT PRINCIPLES FOR LANDSCAPE CONTRACTORS, Charles Vander Kooi, California Landscape Contractors Association, Sacramento, CA., 1984.

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.1 **TASK:** Mows greens, roughs, collars, aprons, and fairways.

PERFORMANCE OBJECTIVE:

See Tasks 12.1, 13.5, 13.6, 15.7

CONDITIONS: Given a golf course to maintain and appropriate equipment,

EVALUATION: mows greens roughs, collars, aprons, and fairways.

STANDARD: Equipment will be adjusted to mow at the designated height and operated in a safe manner.

STUDENT LEARNING EXPERIENCES:

1. Define the terms "green, "rough", "collar", "apron", and "fairway".
2. Visit a golf course maintenance shop and examine the large scale and specialized mowing equipment used to maintain a golf course.
3. Operate a small tractor with a 5 or 6 gang mowing attachment.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss basic similarities and differences in "commercial" and "golf course" grounds maintenance.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Mowers suitable for large scale maintenance and greens maintenance.

RESOURCES:

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, University of Arizona, Tucson, AZ.

GREENSKEEPING, Pennsylvania Instructional Materials Service, 1981, available through Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH.

15.0 COMPETENCY/SKILL: Maintains golf courses.

15.2 TASK: Removes and relocates cups.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a golf course green with a cup to be relocated, a cup puller and cup cutter,

EVALUATION: removes and relocates cups.

STANDARD: Cup will be properly relocated and old cup hole repaired to leave a smooth green.

STUDENT LEARNING EXPERIENCES:

1. Use a cup cutter to open a designated new cup.
2. Use a cup puller to remove and replace a cup.
3. Refill and repair the old cup location.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the proper repair of the green.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Golf green, cup cutter, cup puller.

RESOURCES:

STUDENT REFERENCE ON TURF MANAGEMENT, Department of Agricultural Education, University of Arizona, Tucson, AZ.

GREENSKEEPING, Pennsylvania Instructional Materials Service, 1981, available through Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH.

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.3 **TASK:** Irrigates greens for optimum growth.

PERFORMANCE OBJECTIVE:

See Tasks 6.1, 6.2

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss construction techniques used to prepare sub-irrigated greens.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.4 **TASK:** Applies fertilizers and top dressings.

PERFORMANCE OBJECTIVE:

See Tasks 3.1, 3.2, 3.4, 15.6

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.5 **TASK:** Identifies and controls turf insects, weeds, and diseases.

PERFORMANCE OBJECTIVE:

See Tasks 13.2, 13.3, 13.4

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.6 **TASK:** Aerates turf.

PERFORMANCE OBJECTIVE:

See Tasks 13.10, 15.6

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.7 **TASK:** Verticuts turf.

PERFORMANCE OBJECTIVE:

See Tasks 13.10, 15.6

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.8 **TASK:** Overseeds turf.

PERFORMANCE OBJECTIVE:

See Tasks 13.11, 15.6

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

15.9 **TASK:** Repairs divots.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a fairway to maintain, soil mix, and shovel,

EVALUATION: repairs divots.

STANDARD: Divot holes will be filled with soil mix and compacted; debris will be removed from the course.

STUDENT LEARNING EXPERIENCES:

1. Prepare an amended soil mix suitable for local conditions.
2. Locate divots on golf course, fill with soil, and tamp level.
3. Pick up and dispose of divot material as encountered.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Soil mix components, shovel.

RESOURCES:

GREENSKEEPING, Pennsylvania Instructional Materials Service, 1981, available through Ohio Agricultural Education Curriculum Materials Service, Room 254, 2120 Fyffe Rd, The Ohio State University, Columbus, OH.

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.10 **TASK:** Rakes, trims, and edges sandtraps.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a golf course to maintain and necessary tools,

EVALUATION: rakes, trims, and edges sand traps.

STANDARD: Sandtraps will be cleaned of debris, edged, and raked smooth.

STUDENT LEARNING EXPERIENCES:

1. Use a string trimmer to edge a sand trap.
2. Rake and remove any incidental debris from a sand trap.
3. Rake a sand trap to restore its original surface.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Sandtrap, rake, garbage containers.

RESOURCES:

GREENSKEEPING, Pennsylvania Instructional Materials Service, 1981, available through Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH.

15.0 **COMPETENCY/SKILL:** Maintains golf courses.

15.11 **TASK:** Performs routine maintenance checks on turf maintenance equipment.

PERFORMANCE OBJECTIVE:

See Tasks 13.12, 13.6, 13.7

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

16.0 **COMPETENCY/SKILL:** Operates and maintains horticultural equipment.

16.1 **TASK:** Differentiates between two and four cycle engines.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given engines used to power horticultural equipment,

EVALUATION: differentiates between two and four cycle engines.

STANDARD: The power cycles, and fuel requirements of two and four cycle engines will be accurately described and the major component parts of the engines accurately identified.

STUDENT LEARNING EXPERIENCES:

1. Describe the basic function of the electrical system in two and four cycle engines.
2. Describe the power cycle of two cycle engine.
3. Describe the power cycle of a four cycle engine.
4. Label the component parts of a two cycle engine on a cut-away diagram.
5. Label the component parts of a four cycle engine a component diagram.
6. Identify the fuel requirements of two and four cycle engines.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Disassemble as practical a two and four cycle engine and identify component parts.
2. Discuss reasons why four cycle engines are commonly used in heavier equipment such as mowers and tillers, while two cycle engines are used in blowers, chain saws, and trimmers.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Examples of two and four cycle engines.
2. Cut-away diagrams of two and four cycle engines.

RESOURCES:

HOW TO SELECT, USE AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, Chevron Chemical Company. Consumer Products Division, San Francisco, CA., 1983.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit 0.1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT# 115B, Unit E.3, .5, F.2, Vocational Instructional Services, College Station, TX., 1985.

16.0 **COMPETENCY/SKILL:** Operates and maintains horticultural equipment.

16.2 **TASK:** Mixes fuel for a two cycle engine.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given regular gasoline, 2-cycle oil, empty fuel container, funnel, measuring cup graduated in ounces, a two cycle engine powered device, and owner's manual,

EVALUATION: mixes fuel for a two cycle engine.

STANDARD: Fuel mix created will conform with the manufacturer's suggested fuel:oil ratio for the given engine.

STUDENT LEARNING EXPERIENCES:

1. Use a formula to determine how many ounces of 2-cycle oil should be added to a gallon of gasoline to create 24:1, 32:1, and 50:1 fuel:oil mixes.

2. Determine the proper fuel:oil mix for a given piece of equipment by looking it up in the owner's manual.

3. Create a fuel mix by adding half the gasoline, the measured amount of oil, then the remainder of the gasoline to an appropriate fuel container, and agitate to distribute the oil.

4. Discuss the probable consequences of using an improper fuel mix in a two cycle engine.

5. Discuss the probable consequences of using gasoline mixed with oil in a four cycle engine.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss reasons why there is no one single mix for all 2 cycle engines.

2. Discuss the basic reasons why fuel should not be mixed in the gas tank of the two cycle engines.

3. Prepare or present a simple conversion chart listing ounces per gallon of oil to gas for commonly used ratios.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Regular gasoline, 2 cycle oil, fuel containers, measuring cup graduated in ounces, funnel.

2. Owner's manuals for specific two cycle equipment.

RESOURCES:

HOW TO SELECT, USE AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, Chevron Chemical Company. Consumer products Division, San Francisco, CA., 1983.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit 0.1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT# 115B, Unit E.3, .5, F.2, Vocational Instructional Services, College Station, TX., 1985.

16.0 **COMPETENCY/SKILL:** Operates and maintains horticultural equipment.

16.3 **TASK:** Recognizes visual and audible signs of equipment malfunction.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given operating horticultural equipment,

EVALUATION: recognizes visual and audible signs of equipment malfunction.

STANDARD: Audio and visual clues to malfunctions will be detected during operations, the equipment will be shut down, and the problem will be corrected on site or the equipment returned for repairs.

STUDENT LEARNING EXPERIENCES:

1. Prepare a checklist of items which can be visually inspected before operating horticultural equipment.
2. List visual clues which are likely to indicated malfunction while operating.
3. Describe the functions of an ammeter and oil pressure gauge.
4. List audible clues that are likely to indicate malfunction.
5. List the steps to be taken when equipment malfunction is suspected.
6. Troubleshoot a small engine.
7. Analyze the deposits on a spark plug for visual clues to the condition of the engine, carburation, or fuel mix.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Operate two and four cycle horticultural equipment to demonstrate what the machinery sounds like when it is "right".
2. Differentiate between the kinds of problems which can be solved in the field (loose nuts, loose wires etc.), problems which can be worked on in the shop (blown gaskets, broken wheel mounts etc.), and problems best jobbed out: scored pistons, cracked heads, and the like.
3. Discuss the proposition that the only real maintenance is preventative maintenance, everything else is repair.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Assortment of operating horticultural equipment.

RESOURCES:

HOW TO SELECT, USE AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, Chevron Chemical Company. Consumer products Division,San Francisco, CA., 1983.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit 0.1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT# 115B, Unit E.3, .5, F.2, Vocational Instructional Services, College Station, TX., 1985.

16.0 **COMPETENCY/SKILL:** Operates and maintains horticultural equipment.

16.4 **TASK:** Adjusts equipment for optimum operation.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given two cycle and four cycle horticultural equipment, fuel, and hand tools,

EVALUATION: adjusts equipment for optimum operation.

STANDARD: Equipment will run smoothly at idle and at operating speed.

STUDENT LEARNING EXPERIENCES:

1. Locate the idle adjustment screw on a given piece of equipment, using the owner's manual.
2. Start the engine and allow to warm up, then adjust the idle screw to produce smooth running at minimum RPM.
3. Locate the needle valve adjustment screws on the carburetor of a given piece of equipment using the owner's manual.
4. Use a screw driver to adjust the low idle needle valve to produce smooth running at minimum RPM.
5. Use a screwdriver to adjust the main fuel needle valve to produce smooth running at operating RPM.
6. Adjust and balance the needle valves on "trigger" operated equipment so that response from low to high speed is fluid and free of stutter.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate proper adjustment of needle valves for low and high range operations.
2. Adjust a two cycle engine to produce maximum power at operating speed according to manufacturer's instructions.
3. Review proper safety precautions to follow when operating/adjusting power equipment.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Demonstrate proper adjustment of needle valves for low and high range operations.
2. Adjust a two cycle engine to produce maximum power at operating speed according to manufacturer's instructions.
3. Review proper safety precautions to follow when operating/adjusting power equipment.
4. Operable grounds maintenance equipment, fuel, screwdrivers, cloths.

RESOURCES:

HOW TO SELECT, USE AND MAINTAIN GARDEN EQUIPMENT, Ortho Books, Chevron Chemical Company. Consumer Products Division,San Francisco, CA., 1983.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit 0.1, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT# 115B, Unit E.3, .5, F.2, Vocational Instructional Services, College Station, TX., 1985.

16.0 **COMPETENCY/SKILL:** Operates and maintains horticultural equipment.

16.5 **TASK:** Performs routine maintenance as recommended by the owner's manual.

PERFORMANCE OBJECTIVE:

See Tasks 10.14, 13.12

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

16.0 **COMPETENCY/SKILL:** Operates and maintains horticultural equipment.

16.6 **TASK:** Operates and maintains tractors.

PERFORMANCE OBJECTIVE:

(NOTE: For a complete treatment of tractor maintenance see Competencies 1-22, Agriculture Power and Machinery, Arizona Department of Education; Arizona Center for Vocational Education, Center for Excellence in Education. Northern Arizona University, 1986).

CONDITIONS: Given a tractor to be used in horticultural operations, fuel, and attachments,

EVALUATION: operates and maintains a tractor.

STANDARD: Fluid levels will be checked prior to starting tractor, selected implements will be attached to the PTO according to owner's manual, and tractor will be operated in a safe manner over a selected course.

STUDENT LEARNING EXPERIENCES:

1. Inspect fuel, water, oil, and hydraulic fluid levels on tractor and add as necessary.
2. Attach implement to PTO following instructions in owner's manual.
3. Locate throttle, gear selector, clutch, transfer case, PTO take off, brake, hydraulic controls, and ignition switch according to owner's manual.
4. Select neutral and start tractor engine according to owner's manual.
5. Use hydraulic controls to raise bucket and implement as required.
6. Adjust throttle, select an operating range, engage gear shift and drive tractor over prescribed course.
7. Use a gannon to level an area of soil.
8. Use a tiller to till a ground bed.
9. Use a front end loader to pick up, move, and place soil or rock.
10. Use an auger to drill planting holes.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate correct procedures for starting and operating a tractor and using PTO implements.

2. Review reasons why on should not run a diesel out of fuel, and demonstrate process of restarting a dry diesel.

3. Prepare a course to be navigated by a beginning tractor driver.

4. Review or demonstrate the safe use of tractors and implements on slopes.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Tractor and implements used in horticultural operations, fuel.

2. Cones or other markers to outline a course.

3. Area of ground or job site where implements may be used effectively.

RESOURCES:

AGRICULTURE POWER AND MACHINERY, Arizona Center for Vocational Education, Northern Arizona University, Flagstaff, AZ., 1986.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N.5, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT# 115B, Unit E.3, F.3, Vocational Instructional Services, College Station, TX., 1985.

16.0 **COMPETENCY/SKILL:** Operates and maintains horticultural equipment.

16.7 **TASK:** Operates and maintains trucks.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a truck to be used in horticultural operations, fuel, and a course to navigate,

EVALUATION: operates and maintains trucks.

STANDARD: Fluid levels, tires, and air filter will be checked prior to starting truck, and trick will be driven safely over selected course.

STUDENT LEARNING EXPERIENCES:

1. Identify type of vehicle license, driver's license, and insurance coverage necessary to operate a commercial vehicle engaged in horticultural operations.
2. Check radiator water level, oil level, brake fluid level, transmission fluid level, air filter, and belts prior to starting truck.
3. Inspect tires visually for signs of excessive wear, uneven wear which may indicate an alignment or brake problem, road damage, and check inflation with an air gauge.
4. Select neutral and start truck according to owner's manual.
5. Drive truck over selected course.
6. Describe utilitarian features of trucks best suited for landscape installation, landscape maintenance and irrigation installation.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Prepare a course to be navigated by beginning truck drivers.
2. Review the probable consequences of driving an uninsured commercial vehicle in the State of Arizona.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. A light truck (pick-up to 2 1/2 ton), fuel, and markers to delineate a course.

RESOURCES:

AGRICULTURE POWER AND MACHINERY, Arizona Center for Vocational Education, Northern Arizona University, Flagstaff, AZ., 1986.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit N.5, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT# 115B, Unit E.3, F.3, Vocational Instructional Services, College Station, TX., 1985.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.1 **TASK:** Identifies living and non-living materials used in floral designs.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an assortment of florist materials,

EVALUATION: identifies living and non-living materials used in floral designs.

STANDARD: Commonly used live and dried florist material will be correctly identified.

STUDENT LEARNING EXPERIENCES:

1. Identify six types of floral material most commonly used in dried form.
2. Identify six types of floral materials used as green fill.
3. Differentiate between pompom, daisy, quill, fuji, and spider mums.
4. Identify 12 types of living flowers frequently used in floral arrangements.
5. List floral material most commonly associated with Thanksgiving, Christmas, and Valentines Day.
6. Call a wholesale floral supply house and determine current market price of "fancy" carnations, and "shorts".
7. List the uses of "oasis", clay, and "frogs".

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present or show slides of less commonly used floral material such as heliconia, protea, torch ginger, spathyphyllum, to indicate range of possibilities.
2. Discuss the association of certain floral material with certain events, i.e., gladiolus and calla lilies with funerals, daisies with Mother's Day, holly with Christmas.
3. Discuss basic grading and pricing of floral material at the wholesale level.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Dried floral material such as helichrysum, gypsophila, gomphrena, statice, eucalyptus, ornamental gourds, and grasses.

2. Green filler material such as asparagus plumosus, asparagus sprengerii, boxwood, myrtle, ti leaves, leatherleaf fern, etc.

3. Commonly used fresh flowers as available: carnations, mums, roses, freesia, daisies, asters, iris, daffodils, etc.

4. Floral oasis, clay, frogs.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit P, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit Q.9, Vocational Instructional Services, College Station, TX., 1985.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.2 **TASK:** Spray tints both live and dried floral material.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given floral material material and assorted spraycans of tint,

EVALUATION: spray tints both live and dried floral material.

STANDARD: Tinting will enhance design effect or render material more suitable for a specific use.

STUDENT LEARNING EXPERIENCES:

1. Spray tint cut flowers to achieve a "bi-color" effect.
2. Spray tint dried floral material to increase its vibrancy.
3. Use a cardboard mask and spray tint a potted mum without discoloring foliage.
4. Use spray tints to dramatize a sound but neutral toned arrangement.
5. Experiment with screens, masks, intensity of colors and multiple tints to explore the range of possible effects.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate proper spray tinting of live and dried floral material and present an arrangement where tinting is used effectively.

2. Present an example of tinting in questionable taste such as a poorly dressed, over sprayed, glitter strewn chrysanthemum.

3. Present an arrangement which uses spraying dramatically, perhaps with white carnations set off against black fill.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Dried and fresh floral material, spray tints, scraps of cardboard, scraps of screening materials.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit P, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit Q.9, Vocational Instructional Services, College Station, TX., 1985.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.2 **TASK:** Dip dyes live floral products.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given appropriate live flowers, dye, buckets, and water,

EVALUATION: dip dyes live floral product.

STANDARD: Flowers will be properly prepared for dyeing and dyes will be mixed according to manufacturers directions.

STUDENT LEARNING EXPERIENCES:

1. Identify the underlying principle which permits dip dyeing to work.
2. Remove bottom foliage from stems of flowers and trim ends with sharp knife.
3. Mix floral dye with water according to manufacturer's recommended rates and insert stems in dye for recommended period of time.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. White carnations or other floral material to be dyed, floral dye, water, buckets.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit P, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit Q.9, Vocational Instructional Services, College Station, TX., 1985.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.4 **TASK:** Wires flowers.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given floral material and supplies,

EVALUATION: wires flowers

STANDARD: Flowers will be wired using piercing, straight wire, hairpin, and hook wire method with minimum damage too or loss of floral material.

STUDENT LEARNING EXPERIENCES:

1. Discuss practical and functional reasons why floral stems are wired.
2. Wire a stem using the straight wire method.
3. Pierce and wire an appropriate stem.
4. Wire a stem to a hairpin.
5. Wire a stem using a floral pik.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate proper wiring of a stem and wrapping with floral tape.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Floral material to be wired, picks, pins, pre-cut wire, floral tape, scissors.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit P, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit Q.9, Vocational Instructional Services, College Station, TX., 1985.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.5 **TASK:** Makes nets or fans and bows.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a floral presentation to be dressed, necessary materials, and supplies,

EVALUATION: makes nets or fans and bows.

STANDARD: Ornaments created will be neat, in scale with the floral presentation, and created with a minimum of wasted material.

STUDENT LEARNING EXPERIENCES:

1. Select appropriate color and width of ribbon for a floral piece, tie, wire, and install a bow.
2. Fold, tie, and trim a fan for a floral piece.
3. Set up and operate a bow tying machine if/as available for a "production run" of ornamental bows.
4. Dress a flowering potted plant with basket, netting, ribbon, and bow.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the use of an automatic bow tying machine if/as available.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Ribbon, netting, thread, piks, scissors, florist tape.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit P, Vocational Instructional Services, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit Q.9, Vocational Instructional Services, College Station, TX., 1985.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.6 **TASK:** Identifies basic principles of floral design.

CONDITIONS: Given examples of floral arrangements,

EVALUATION: identifies basic principles of floral design.

STANDARD: Both two dimensional and three dimensional design considerations will be identified and the basic forms defined.

STUDENT LEARNING EXPERIENCES:

1. List the characteristics of a symmetrical triangle arrangement and select an example from designs presented.

2. List the characteristics of a horizontal arrangement and select an example from designs presented.

3. List the characteristics of an oval arrangement and select an example from designs presented.

4. List the characteristics of an asymmetrical triangle arrangement and select an example from designs presented.

5. List the characteristics of a right angle arrangement and select an example from designs presented.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present illustrations of floral arrangements which use basic design principles in both formal and informal styles.

2. Present illustrations of unusual or imaginative use of materials to suggested that within the conventions of good form, the designer is free to be highly creative.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Examples of floral arrangements illustrating principles of design, or photographs of floral arrangements.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

FLORAL DESIGN SET PIECES, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1984.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.7 **TASK:** Designs artificial or dried flower and foliage arrangements.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an arrangement to create, materials, tools, and supplies,

EVALUATION: designs artificial or dried flower and foliage arrangements.

STANDARD: Arrangements will reflect design principles and be appropriate in scale for the selected container.

STUDENT LEARNING EXPERIENCES:

1. Choose the style of design you would like to create and select a container to hold it.
2. Select materials for major components of design, trim and install.
3. Select filler materials for design, trim and install.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Dried or artificial floral materials, containers, oasis or clay, glue guns, wire, scissors, shears.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

DRIED MATERIALS (Slides text), Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1984.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.8 **TASK:** Designs flower arrangements for display.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an arrangement to create, materials, tools, and supplies,

EVALUATION: designs flower arrangements for display,

STANDARD: Arrangement will reflect design principles and be appropriate in scale for container or intended use.

STUDENT LEARNING EXPERIENCES:

1. Choose the style of design you would like to create and select an appropriate container or form for it.
2. Select materials for major components of design, trim and install.
3. Select filler material for design, trim and install.
4. Dress arrangement with ribbon and bow if/as needed.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present illustrations of or create as appropriate a funeral piece (casket spray, half casket spray, companion arrangement, wreath, pillow arrangement), as this type of work is a significant part of many florist operations.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Live floral material for arrangements, containers, oasis, glue gun, watering can, floral preservative, scissors, stem wires, florist tape.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

FLORAL TRIBUTES (slides/script), Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1984.

17.9 **TASK:** Designs flower arrangements to wear.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an arrangement to create, materials, tools, and supplies,

EVALUATION: designs flower arrangements to wear.

STANDARD: Arrangement will be neatly executed and in proportion to intended use.

STUDENT LEARNING EXPERIENCES:

1. Construct a boutonniere.
2. Construct a double end carnation corsage.
3. Construct a single end rose corsage.
4. Construct a cattleya orchid corsage.
5. Thread and knot a lei.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Carnations, sweetheart roses, catteleya orchids, orchid tubes, pins, florist tape, netting, glue gun, florist tape, scissors, needle, heavy waxed thread, ribbon.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

CORSAGE CONSTRUCTION (slides/script), Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1980.

17.0 **COMPETENCY/SKILL:** Designs and prepares floral arrangements.

17.10 **TASK:** Designs flower arrangements to carry.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an arrangement to create, materials, tools, and supplies,

EVALUATION: designs flower arrangements to carry.

STANDARD: Bouquets for bridal party or other uses will be seasonally appropriate, reflect a uniform theme and be appropriately scaled.

STUDENT LEARNING EXPERIENCES:

1. Select and wire floral material for a bouquet.
2. Select appropriate filler for a bouquet.
3. Assemble and dress a bouquet with netting and ribbon.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the marketing possibilities presented to the florist by a wedding: flowers for the bridal party, reception centerpiece, table pieces, single flowers for each of the guests, etc.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Fresh flowers and fill, wire, netting, ribbon, scissors, florist tape.

RESOURCES:

FLORAL DESIGN AND MARKETING, Ohio Agricultural Education Curriculum Materials Service, Ohio State University, Columbus, OH., 1987.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit P, Vocational Instructional Services, F.E. Box 182, College Station, TX., 1985.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, CAT #115B, Unit Q.9, Vocational Instructional Services, F.E. Box 182, College Station, TX., 1985.

18.0 **COMPETENCY/SKILL:** Demonstrates skills in selling and merchandising.

18.1 **TASK:** Meets and greets customers.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a situation where a customer has entered a place of business,

EVALUATION: meets and greets customers.

STANDARD: Customer will be greeted promptly and courteously with an approach which encourages conversation.

STUDENT LEARNING EXPERIENCES:

1. Discuss the role of the sales person in horticulture related trades.
2. Differentiate between "greeting", "service", and "merchandise" approaches to a customer.
3. Meet and greet "customers" in a simulated sales situation.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Set up a simulated garden center sales where sales techniques can be practiced.
2. Review the keys to successful sales: product knowledge, a willingness to serve the customer, and an ability to close.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Actual items or simulations or items which might be found in a garden center.

RESOURCES:

ARIZONA CERTIFIED PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit Q.3, Vocational Instructional Services, College Station, TX., 1985.

MARKETING EDUCATION, Arizona Center for Vocational Education Center For Excellence in Education, Northern Arizona University, 1987.

18.0 **COMPETENCY/SKILL:** Demonstrates skills in selling and merchandising.

18.2 **TASK:** Asks appropriate questions to determine customer's needs.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a situation where a customer has entered a place of business and been greeted,

EVALUATION: asks appropriate questions to determine customer's needs.

STANDARD: Questions asked will be open ended and lead to a sales opportunity.

STUDENT LEARNING EXPERIENCES:

1. Differentiate between closed and open ended questions.
2. Ask open ended questions of a "customer" who is looking at insecticides, fertilizers, seeds, tools, or nursery stock.
3. Ask questions which will help define the customer's actual needs.
4. Deal diplomatically with a "customer" who is returning dead or defective material.
5. Close a sale with a customer by asking a closing question.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Impersonate a "misinformed" customer who thinks his lawn needs fertilizer when it is actually being attacked by insects, or wants to buy an insecticide to get rid of the mildew on his roses, or can't understand why his new trees are dying when he soaks them twice a day without fail, etc.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Actual items or simulations of items which are found in a garden center.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 59-64, Arizona Nursery Association, Phoenix, AZ., 1981.

MARKETING EDUCATION, Competency 24.6, Arizona Center for Vocational Education, Center For Excellence in Education, Northern Arizona University, 1987.

18.0 **COMPETENCY/SKILL:** Demonstrates skills in selling and merchandising.

18.3 **TASK:** Reads and explains product labels.

PERFORMANCE OBJECTIVE:

See Task 3.1, 3.2, 3.4

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

MARKETING EDUCATION, Competency 24.3, Arizona Center For Vocational Education, Center For Excellence in Education, Northern Arizona University, 1987.

18.0 **COMPETENCY/SKILL:** Demonstrates skills in selling and merchandising.

18.4 **TASK:** Identifies "tie-in" sales for merchandise.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a sales situation where the sale of a given item is closed,

EVALUATION: identifies "tie-in" sales for merchandise.

STANDARD: Tie in items suggested to reflect an understanding of the customer's needs and the sales process is followed through to an additional close.

STUDENT LEARNING EXPERIENCES:

1. Converse with a "customer" who has just purchased some garden seed, and suggested 6 items which might improve his chance for success.
2. Suggest six tie-in items to a "customer" who has just purchased a 15 gallon tree.
3. Suggest six tie-in items to a customer who has just purchased a pruning shear.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Set up a simulated garden center sales area.
2. Impersonate a customer who is not quite sure of what all is needed to complete the job he or she has in mind.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Actual items or simulations of items found in a garden center.

RESOURCES:

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, pp. 59-64, Arizona Nursery Association, Phoenix, AZ., 1981.

MARKETING EDUCATION, Competency 24.9, Arizona Center for Vocational Education, Center For Excellence in Education, Northern Arizona University, 1987.

18.0 COMPETENCY/SKILL: Demonstrates skills in selling and merchandising.

18.5 **TASK:** Displays merchandise for optimum customer appeal.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a display area to be set up for sales,

EVALUATION: displays merchandise for optimum customer appeal.

STANDARD: Merchandise will be displayed with regard to principles of sales promotion with seasonal, or promotional, high profit, and impulse items receiving the best floor and shelf space.

STUDENT LEARNING EXPERIENCES:

1. Locate the best selling areas on a diagram of a garden center floor plan.
2. Locate the best selling spaces on a diagram of store shelving.
3. List impulse items which might benefit from high exposure in the garden center.
4. List types of staple goods well suited to moderate traffic areas.
5. List types of specialty goods best suited to lower traffic areas.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Floor plan and shelving plan for a hypothetical garden center.

RESOURCES:

ARIZONA CERTIFIED PROFESSIONAL TRAINING MANUAL, PP. 54-58, Arizona Nursery Association, Phoenix, AZ., 1981.

HORTICULTURAL OPERATIONS STUDENT MATERIALS, CAT #31A, Unit Q.2, Vocational Instructional Services, College Station, TX., 1985.

MARKETING EDUCATION, Competency 26.1-4, Arizona Center for Vocational Education Center For Excellence in Education, Northern Arizona University, 1987.

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural concern.

19.1 **TASK:** Identifies the various organizational structures of horticultural businesses.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a horticultural business to be established,

EVALUATION: identifies the various organizational structures of horticultural businesses.

STANDARD: The advantages and disadvantages of forms of businesses will be described and an appropriate form selected for a given business.

STUDENT LEARNING EXPERIENCES:

1. Describe the three basic forms of business enterprise--sole proprietorship, partnership, and corporation--and list advantages and disadvantages provided by each form.
2. Compare the legal costs and taxes for starting each of the three basic business forms.
3. Compare the management for each of the three forms.
4. Explain the implications of obtaining capital based on the type of ownership.
5. List states and local requirements for forming each of the three forms.
6. Identify the decision factors affecting the selection of an appropriate form of business ownership.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Have students interview a business person who operates a business in a form which they are considering, and determine the owner's reasons for selecting a given form.
2. Ask three business owners, one from each form, to share with the class their reasons for choosing a particular form of business.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

MARKETING EDUCATION, Competency 6.1, Arizona Center for vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.2 **TASK:** Describes the roles of licensing, bonding, and insurance in the operation of a small horticultural business.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a hypothetical business situation,

EVALUATION: describes the roles of licensing, bonding and insurance in the operation of a small horticultural business.

STANDARD: The applicable areas of government regulations will be defined and applied.

STUDENT LEARNING EXPERIENCES:

1. Discuss the significance of government rules and regulations to the business owner.
2. Describe city/county business permits and fees required for the proposed business.
3. Determine the zoning ordinances which affect the proposed business.
4. Fill out sample applications for contractor's license, state and local sales tax licenses, seed dealer's license, etc. as required by a given business.
5. Describe state and federal taxes the business will collect and/or pay.
6. Summarize the intent of each of the following regulations or regulating agencies:

   The Arizona Registrar of Contractors.
   OSHA
   Child Labor Laws.
   The Civil Rights Act of 1964.
   The Age Discrimination Act of 1973.
   The Federal Unemployment Tax Act.
   Workman's Compensation Laws.
   Income Tax laws.
   Social Security Tax Laws.
   Federal Trade Commission.
   Consumer Product Safety Commission.
   The Environmental Protection Agency.

7. Classify information according to whom it is designed to protect.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present and review federal, state, and local rules and regulations governing licenses, permits, and tax responsibilities.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Sample business license applications.

RESOURCES:

MARKETING EDUCATION, Competency 6.5, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.3 **TASK:** Fills out an application for a business license.

PERFORMANCE OBJECTIVE:

See Task 19.2

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

19.4 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.4 **TASK:** Describes the role of credit in starting/operating a horticultural business.

PERFORMANCE OBJECTIVES:

CONDITIONS: Given loan sources, repayment terms, legal terms, interest charges, and security and collateral requirements from different government and private organizations,

EVALUATION: describes the role of credit in starting and operating a horticultural business.

STANDARD: The loan sources and terms must be in accordance with the type of activity being financed, and applications filled out accurately and completely.

STUDENT LEARNING EXPERIENCES:

1. Name sources of credit for the following horticultural business assets: a tractor, a garden center, a greenhouse, nursery stock.
2. Name likely sources of capital for short term operating loans and real estate loans.
3. Describe the role of the SBA in financing small horticultural concerns.
4. Identify the loan requirements as specified on a given loan application.
5. Fill out applications for credit from banks or other sources.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present and review federal, state, and commercial loan applications.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Samples of loan applications.
2. Computer with spreadsheet software and/or calculators.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.8, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

MARKETING EDUCATION, Competency 21.1,.2, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.5 **TASK:** Fills out an application for credit from a bank or other credit source.

PERFORMANCE OBJECTIVE:

See Task 19.4

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural concern.

19.6 **TASK:** Fills out individual and business tax forms for horticultural business.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given personal and business tax forms,

EVALUATION: fills out individual and business tax forms for a horticultural business.

STANDARD: Forms will be completely filled out and numerically correct.

STUDENT LEARNING EXPERIENCES:

1. Discuss the personal tax implications of different business forms including sub-chapter S or sub-chapter C corporations, sole proprietorships, general and limited partnerships.
2. Discuss ways in which new tax reforms will affect horticultural businesses.
3. Demonstrate how to correctly complete personal and business tax forms.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Tax forms with instructions.
2. Computer with a spread sheet program or calculators.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.10, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.7 **TASK:** Develops goals for a small business.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an interest in a specific horticultural business,

EVALUATION: develops goals for a small business.

STANDARD: The goals will be clearly expressed and their feasibility detailed in a business plan.

STUDENT LEARNING EXPERIENCES:

1. Prepare a business plan including the following elements:

   - A description of the business and its overall goals.
   - The amount and type of financing requested and financing plan.
   - Products or services to be sold.
   - Markets and marketing strategy.
   - Organizational and management team.
   - Number of employees and skill level.
   - Physical facilities.
   - Community impact.
   - Financial statements (income statement and balance sheet).

2. Describe how business plans are evaluated.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Construct or present sample business plans for horticultural businesses.

2. Demonstrate the use of a computer to develop financial statements.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Computer and spreadsheet software.

2. Sample business plans.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.19, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

MARKETING EDUCATION, Competency 16.2, .3, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.8 **TASK:** Evaluates employee performance.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given situations in which management skills are to be used,

EVALUATION: evaluates employee performance.

STANDARD: Firings will convey reasons without causing undue bad feelings; hirings will exhibit the determination of necessary qualifications; and training and work scheduling will be appropriate for the employee and consistent with the needs of the firm.

STUDENT LEARNING EXPERIENCES:

1. Prepare job descriptions for entry level, supervisory, and management levels in a given horticultural business.
2. From a list of applicants or selection of resumes, select the best qualified person for given jobs in a horticultural schedule.
3. List three factors to consider when designing a work schedule.
4. Develop objectives to be met in a training program for entry level, supervisory, sales, and management personnel.
5. Identify training methods which can be used successfully in a horticultural business.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the roles of scheduling, training, and proper selection of employees as they relate to morale, productivity, competency, and profitability of horticultural concerns.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Sample resumes.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.3, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.9 **TASK:** Develops employee training and work schedules.

PERFORMANCE OBJECTIVE:

See Task 19.8

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

19.0 **COMPETENCY/SKILL:** Performs management functions for the efficient operation of a horticultural business.

19.10 **TASK:** Prepares bids.

PERFORMANCE OBJECTIVE:

See Tasks 5.12, 6.11

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

20.0 **COMPTENCY/SKILL:** Demonstrates record keeping skills.

20.1 **TASK:** Develops a budget listing anticipated income and expenses.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a horticultural project.

EVALUATION: develops a budget listing anticipated income and expenses.

STANDARD: The budget will realistically reflect anticipated income and expenses based on local market conditions.

STUDENT LEARNING EXPERIENCES:

1. Identify elements to be considered in the development of a budget.
2. Determine the market value of a horticultural product to be produced or service to be supplied.
3. Complete the Budget record in the Arizona Vocational Agricultural Planning and Accounting Book if/as appropriate.
4. Construct a budget model spread sheet on a micro computer and demonstrate budget effects by manipulating variables.
6. Compare cash flow and conventional budgeting and select an appropriate model for a horticultural project.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present sample budgets for horticultural projects.
2. Demonstrate manipulation of variables in budget spreadsheet program.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Arizona Vocational Agricultural Planning and Accounting Book.
2. Sample cash flow and conventional budgets.
3. Computer and spreadsheet software.

RESOURCES:

ARIZONA VOCATIONAL AGRICULTURE SOE PLANNING AND ACCOUNTING BOOK, p. 5, Arizona Vocational Agricultural Teachers Association, Inc., Phoenix, AZ., 1984.

MARKETING EDUCATION, Competency 29.3, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

20.0 **COMPETENCY/SKILL:** Demonstrates recordkeeping skills.

20.2 **TASK:** Fills out a business agreement.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a horticultural business situation which requires a formal agreement,

EVALUATION: fills out a business agreement.

STANDARD: The agreement must be completed in full and signed by both parties.

STUDENT LEARNING EXPERIENCES:

1. Review sample business agreements from horticultural contractors and employers and explain the details of the agreement.
2. Develop a contract for horticultural services to be performed.
3. Identify steps which can be taken in the event an agreement is not honored as written.
4. Fill out "Ownership" or "Placement" agreements in the Arizona Vocational Agricultural SOE Planning and Accounting Book if/as appropriate.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Present and review sample service, sales, and employment contracts.
2. Discuss the wisdom of obtaining three bids for services to be performed for a horticultural business, and suggest criteria for selecting a bid.
3. Identify areas of redress when contracts are violated such as personal negotiation, Small Claims Court, the Contractor's Recovery Fund, etc.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Assorted business agreements and forms.
2. ARIZONA VOCATIONAL AGRICLTURE SOE Planning and Accounting Book.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.15, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

ARIZONA VOCATIONAL AGRICULTUR SOE PLANNING AND ACCOUNTING BOOK, p. 7-8, Arizona Vocational Agricultural Teachers Association, Inc., Phoenix, AZ., 1984.

20.3 **TASK:** Prepares opening and closing inventories for non-depreciable items.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a horticultural business,

EVALUATION: prepares opening and closing inventories for non-depreciable items.

STANDARD: Items must be properly and completely identified and valuations accurately assessed.

STUDENT LEARNING EXPERIENCES:

1. Define the value and purpose of an inventory.
2. Differentiate between depreciable and non-depreciable items.
3. Discuss depreciation methods and life to be used in computing a depreciable property inventory.
4. Use a computer and appropriate software to create an inventory system.
5. Use a computer to record physical inventory and assess valuations.
6. Fill out the Non Depreciable and Depreciable inventory schedules in the Arizona Vocational Agricultural SOE Planning and Accounting Book if/as appropriate.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss common methods of valuing horticultural properties.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Sample inventory sheets.
2. Computer and spreadsheet software.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.15, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

ARIZONA VOCATIONAL AGRICULTUR SOE PLANNING AND ACCOUNTING BOOK, p. 10-11, Arizona Vocational Agricultural Teachers Association, Inc., Phoenix, AZ., 1984.

20.0 **COMPETENCY/SKILL:** Demonstrates recordkeeping skills.

20.5 **TASK:** Prepares opening and closing inventories for depreciable items.

PERFORMANCE OBJECTIVE:

See 20.4

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

20.0 **COMPETENCY/SKILL:** Demonstrates recordkeeping skills.

20.6 **TASK:** Records income and expense entries in a record book.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given operating information for a horticultural business,

EVALUATION: records income and expense entries in a record book.

STANDARD: Individual pieces of data will be correctly identified and entered in the corresponding record category.

STUDENT LEARNING EXPERIENCES:

1. Identify different types of records commonly kept in horticultural businesses and define their purposes.
2. Use a computer to record income and expense records.
3. Manually record income and expense records in a ledger or in the ARIZONA VOCATIONAL AGRICULTURE PLANNING AND ACCOUNTING BOOK if/as appropriate.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Demonstrate the use of computer software in record keeping.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Computer and spreadsheet software.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.1, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

MARKETING EDUCATION, Competency 29.2; 30.1, .2, .3, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

ARIZONA VOCATIONAL AGRICULTUR SOE PLANNING AND ACCOUNTING BOOK, p. 14-15 Arizona Vocational Agricultural Teachers Association, Inc., Phoenix, AZ., 1984.

289

20.7 **TASK:** Calculates net profit for a business enterprise.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given relevant financial information for a horticultural business,

EVALUATION: calculates net profit for a business enterprise.

STANDARD: All accounts must be properly arranged on an income statement and the net profit correctly calculated.

STUDENT LEARNING EXPERIENCES:

1. Use a computer and spreadsheet software to prepare a financial statement.
2. Identify ratios which can be calculated from an income statement and analyze the information provided by the ratios.
3. Compare an income statement for a hypothetical horticultural business with the statement found in the annual report of a similar, actual business.
4. Calculate net profit from financial information.
5. Fill out the Ownership and Placement Summary Reports in the ARIZONA VOCATIONAL AGRICULTURE SOE PLANNING AND ACCOUNTING BOOK if/as appropriate.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the types of information normally found in financial statements.
2. Demonstrate the use of a computer in preparing and interpreting financial statements.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Annual reports from horticultural businesses.
2. Computer with spread sheet software and/or calculators.

RESOURCES:

MARKETING EDUCATION, Competency 30.2, .3, 32.2, .3, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.4, 1.6, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

ARIZONA VOCATIONAL AGRICULTUR SOE PLANNING AND ACCOUNTING BOOK, p. 25, Arizona Vocational Agricultural Teachers Association, Inc., Phoenix, AZ., 1984.

20.0 **COMPETENCY/SKILL:** Demonstrates recordkeeping skills.

20.8 **TASK:** Distinguishes between assets and liabilities.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given pertinent financial information,

EVALUATION: distinguishes between assets and liabilities.

STANDARD: Fixed and current assets and long and short term liabilities will be distinguished and interpreted within the context of a balance sheet.

STUDENT LEARNING EXPERIENCES:

1. Describe the importance of the balance sheet and how the balance sheet is used by a business.
2. Differentiate between an asset, liability, and capital account.
3. Describe asset accounts and list them in the order of liquidity.
4. Describe the types of business liabilities, both short term and long term.
5. Define and explain equity.
6. Calculate sub totals and totals of assets and liabilities.
7. Evaluate sample balance sheets for accuracy in format and calculation.
8. Construct a balance sheet for a horticultural activity.
9. Prepare a personal balance sheet and calculate net worth.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Review the basic components of a balance sheet.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Annual reports from horticultural businesses.
2. Computer with spreadsheet software and/or calculators.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.6, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

MARKETING EDUCATION: Competency 30.3, 32.3, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

20.0 **COMPETENCY/SKILL:** Demonstrates record keeping skills.

20.9 **TASK:** Prepares a net worth statement.

PERFORMANCE OBJECTIVE:

See Tasks 20.6, 20.7

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

RESOURCES:

20.0 **COMPETENCY/SKILL:** Demonstrates record keeping skills.

20.10 **TASK:** Summarizes records for a business venture.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given records for a horticultural firm,

EVALUATION: summarizes record for a business venture.

STANDARD: The summary will accurately reflect given records.

STUDENT LEARNING EXPERIENCES:

1. Describe the types of records which lend themselves to summary and interpretation.
2. Describe types of graphs and useful applications in summarizing business records.
3. Prepare a production data summary for a horticultural business.
4. Identify the different ratios and averages that can be obtained from time series production data.
5. Use a computer with word processing, spreadsheet, and graphics software to produce a business summary.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the role fo accurate summaries in evaluating operations and making management decisions.
2. Demonstrate the use of integrated computer software to prepare summaries for presentation.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Computer with integrated business software.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 1.2, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

20.0 **COMPETENCY/SKILL:** Demonstrates recordkeeping skills.

20.11 **TASK:** Operates a calculator and computer.

PERFORMANCE OBJECTIVE:

See Tasks 20.1,.3,.5.,.6,.7,.9

CONDITIONS:

EVALUATION:

STANDARD:

STUDENT LEARNING EXPERIENCES:

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

RESOURCES:

21.0 COMPETENCY/SKILL: Demonstrates desirable personal skills and habits.

21.1 TASK: Listens and observes:

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a variety of verbal instructions,

EVALUATION: listens and observes.

STANDARD: Correctly answers a series of questions regarding the verbal instructions and/or performs a task in a manner which indicates comprehension.

STUDENT LEARNING EXPERIENCES:

1. Describe the characteristics of a good listener.
2. Differentiate between an active and passive listener.
3. Describe how bias can hamper effective communications, and discuss ways bias can be reduced.
4. Listen to a sequence of instructions and repeat them back.
5. Perform an unfamiliar task after receiving verbal instructions.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Have students practice giving and performing verbal series of instructions.
2. Have students analyze the speakers they hear during the course of a day and determine which speakers are easiest to listen to, and why.
3. Tape record students giving instructions, and have the class critique the playback.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Tape recorder and tapes.
2. Sample sets of instructions.

RESOURCES:

MARKETING EDUCATION, Competency 3.8, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

21.0 **COMPETENCY/SKILL:** Demonstrates desirable personal skills and habits.

21.2 **TASK:** Follows directions.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given written and verbal orders.

EVALUATION: follows directions.

STANDARD: The completed assignments must demonstrate an ability to perform tasks as directed.

STUDENT LEARNING EXPERIENCES:

1. Discuss the essentials of effective communication.
2. Discuss barriers to effective communication and how they may be overcome.
3. Follow a given set of instructions to complete a task exactly as directed.
4. Identify times when instructions may best be clarified.
5. Identify times when instructions may best be questioned.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the relationship of the ability to follow directions, independent thinking, and cooperation to the success of a business.
2. Set up role playing situations in which instructions are given and followed.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Sample sets of instructions.

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 7.4, 7.5, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

21.0 **COMPETENCY/SKILL:** Demonstrates desirable personal skills and habits.

21.3 **TASK:** Maintains good relations with customers and/or fellow workers.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a business setting,

EVALUATION: maintains good relations with customers and/or fellow workers.

STANDARD: The ability to cooperate with others to achieve a specified goal will be demonstrated.

STUDENT LEARNING EXPERIENCES:

1. Cite practical reasons why good relations with customers is necessary in a business situation.
2. Identify the personal and business benefits likely to accrue from cooperation with fellow workers.
3. Identify personal attitudes which can be modified to improve cooperation with workers and customers.
4. Handle customer complaints in a diplomatic manner.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss barriers to cooperation which exist in group activities, i.e., personal differences, egos, lack of interpersonal skills, etc.
2. Discuss the chain of cooperation necessary to a successful industry: personal cooperation among workers, departmental cooperation within a business, business cooperation within a trade, trade cooperation within an industry, and industrial cooperation with regulating agencies.
3. Descrie as an example, the probable consequences to employees of nursery customers, managers, sales staff, etc., when the advertising staff fails to cooperate with production staff and advertised items are not ready for sale.
4. Establish role playing situations where tasks cannot be completed or management questions cannot be resolved unless a level of cooperation is attained.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 7.8, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

MARKETING EDUCATION, Competency 10.1, 10.2, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

21.0 **COMPETENCY/SKILL:** Demonstrates desirable personal skills and habits.

21.4 **TASK:** Stays cheerful and helpful.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a business situation,

EVALUATION: stays cheerful and helpful.

STANDARD: Stress will be handled effectively and readily recognized human relations standards will be applied to accomplish the goals of a business.

STUDENT LEARNING EXPERIENCES:

1. Identify four basic human motives which affect employer-employee relationships.

2. Identify situations in which the ability to get along with others may help achieve a goal.

3. Identify stressful situations likely to be encountered in the business environment.

4. Identify useful techniques to minimize stress on the job.

5. Differentiate between being helpful, assuming the responsibilities of others, and being meddlesome.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Establish role playing situations where stress may be overcome, helpfulness appreciated, and cheerfulness contributes to a working environment.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 7.3, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

21.0 **COMPETENCY/SKILL:** Demonstrates desirable personal skills and habits.

21.5 **TASK:** Practices personal hygiene and neatness.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given guidelines on business dress and personal hygiene and an employment situation,

EVALUATION: practices personal hygiene and neatness.

STANDARD: Clothing selected for a business situation will be clean and appropriate to the social and safety requirements of teh job, and personal cleanliness will be apparent.

STUDENT LEARNING EXPERIENCES:

1. Discuss common mistakes in selecting work clothing from social and safety standpoints.
2. Observe standards of appearance of professionals engaged in horticultural businesses.
3. Describe ways in which appearance can be related to employment, advancement, self image, job satisfaction, and safety.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Develop a checksheet for good grooming and appropriate business dress for horticultural operations.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

RESOURCES:

AGRICULTURAL BUSINESS AND MANAGEMENT, Competency 7.16, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

MARKETING EDUCATION, Competency 9.2, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

21.0 COMPETENCY/SKILL: Demonstrates desirable personal skills and habits.

21.6 **TASK:** Is punctual.

PERFORMANC OBJECTIVE:

CONDITIONS: Given business situations with time considerations,

EVALUATION: is punctual.

STANDARD: Reasons why punctuality is important to employers and employees will be fully described.

STUDENT LEARNING EXPERIENCES:

1. Identify reasons why punctuality is important to an employee.
2. Describe the effects of punctuality on work scheduling.
3. Relate the concept of punctuality to appointments, deadlines, and business commitments.
4. Determine who is responsible for being late in the following situations:

   An employee's car breaks down on the way to work and it takes a mechanic almost two hours to fix it.

   A salesman gets stuck in traffic, misses a flight, and has to cancel a meeting with a client.

   A Production Manager gets caught up in repairing a greenhouse fan and misses the first half of a meeting where sales figures are being analyzed.

   A business proprietor keeps his Supervisors waiting while an inexperienced word processor finishes up an important report.

5. Discuss the probable consequences to the individuals and businesses in the above situations.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the differences between the concept of "fault" and the concept of "responsibility", i.e., in the examples above, it may or may not have been the employees' "fault", but each is "responsible" for being late.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

RESOURCES:

MARKETING EDUCATION, Competency 1.2, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

21.0 COMPETENCY/SKILL: Demonstrates desirable personal skills and habits.

21.7 **TASK:** Observes all safety rules and regulations.

PERFORMANCE OBJECTIVE:

See Tasks 3.3, 3.4, 3.5, 10.14, 13.6, 13.7, 15.6, 15.7

CONDITIONS: Given a horticultural business situation,

EVALUATION: observes all safety rules and regulations.

STANDARD: Posted safety warnings will be obeyed, safety apparel will be worn as required, and safety procedures will be followed in the operation of any euipment.

STUDENT LEARNING EXPERIENCES:

1. List areas of horticultural operations which require attention to safety procedures.
2. List sources most likely to provide safety instructions for horticultural operations.
3. Identify the probalbe consequences of using horticultural materials, equipment, and supplies in an unsafe manner.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

RESOURCES:

AGRICULTRUAL BUSINESS AND MANAGEMENT, Competency 7.16, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

21.0 **COMPETENCY/SKILL:** Demonstrates desirable personal skills and habits.

21.8 **TASK:** Identifies and follows company policies.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a new employee orientation manual,

EVALUATION: identifies and follows company policies.

STANDARD: Company policies regarding work hours, rules, dress code, smoking, confidentiality, wage and review, pay periods ill be read and understood as evidenced by employee sign off.

STUDENT LEARNING EXPERIENCES:

1. Review new employee manuals from horticultural business and determine categories of company policies.
2. Interview owners of horticultural companies and determine how formal and informal company policies are conveyed.
3. Describe items which may fall under confidentiality rules in horticultural business.
4. Identify and describe relevant labor laws which must be reflected in company policies.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Have students prepare a policy manual for new employees.
2. Discuss the process for redressing grievances in small and large horticultural concerns.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Employee orientation manuals from horticultural concerns.

RESOURCES:

MARKETING EDUCATION, Competency 33.1, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

22.0 COMPETENCY/SKILL: Demonstrates leadership skills.

22.1 TASK: Organizes and leads a committee.

PERFORMANCE OBJECTIVE:

CONDITIONS:	Given an objective to be met or broad topic to be investigated,
EVALUATION:	organizes and leads a committee.
STANDARD:	The committee will be on a scheduled basis, duties will be assigned and filfilled as evidenced by the timely fulfillment of an objective.

STUDENT LEARNING EXPERIENCES:

1. Identify the advantages of pursuing an objective through a committee.
2. Identify types of undertakings which can be better handled by committess than individuals.
3. List personal skills necessary to lead a committee.
4. Identify an objective, assemble a committee and produce presentable results within four meetings.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Establish specific class times for the meeting of committees.
2. Establish horticultural related materials for committee action and appoint committee leader.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

RESOURCES:

MARKETING EDUCATION, Competency 3.0, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

ADVISORS GUIDE TO THE STUDENT HANDBOOK, National FFA Supply Service, Alexandria, VA., 1980.

22.0 **COMPETENCY/SKILL:** Demonstrates leadership skills.

22.2 **TASK:** Leads and/or participates in a group discussion.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a horticultural issue to be discussed,

EVALUATION: leads and/or participates in a group discussion.

STANDARD: Statements which might cause misunderstanding are identified and clarified, participation is active, and a group is moved to action, consensus, respected disagreement, or closure.

STUDENT LEARNING EXPERIENCES:

1. Identify situations where group discussion is likely to be of benefit, i.e. resolution of conflict.
2. Explain the importance of asking questions for effective communication.
3. Lead a group discussion on a horticultural topic such as "Would training of low level nursery workers result in reduced employee turnover, or is that just how it is with laborers." and achieve a consensus opinion.
4. Lead a group discussion on a horticultural topic such as "Should a new garden center outlet be opened in a neighboring city," and lead the group to action.
5. Lead a group discussion on a horticultural topic such as "The production manager insists that maintenance is wasting time washing trucks while the irrigation system is falling apart faster than the production staff can fix it, and it's not their job, anyway", and lead the group to a resolution of conflict.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Record small group discussions and play back for analysis.

2. Have students critique their group leaders and critique their own performance as participants.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Tape recorder and tapes.

RESOURCES:

MARKETING EDUCATION, Competency 3.9, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

ADVISORS GUIDE TO THE STUDENT HANDBOOK, National FFA Supply Service, Alexandria, VA., 1980.

22.0 **COMPETENCY/SKILL:** Demonstrates leadership skills.

22.3 **TASK:** Prepares and presents a five minute speech.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given a horticultural topic,

EVALUATION: prepares and presents a five minute speech.

STANDARD: The speech will contain an introduction, body, and conclusion and effectively convey intended information.

STUDENT LEARNING EXPERIENCES:

1. Identify situations in which speeches on horticultural topics may be called for.
2. Define tone, volume, and enunciation and describe how they effect spoken communications.
3. Describe the structure and characteristics of an effective speech.
4. Develop and outline a speech.
5. Respond to a series of impromptu questions in front of an audience.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Record student speeches on a video camera and have students prepare a written critique of their own performance.
2. Have student speeches presented to small groups, and have members of the group evaluate the presentation.

INSTRUCTIONAL EQUIPMENT, MATERIALS, AND SUPPLIES:

1. Video camera, recorder, and monitor.

RESOURCES:

MARKETING EDUCATION, Competency 3.10, Arizona Center for vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

ADVISORS GUIDE TO THE STUDENT HANDBOOK, National FFA Supply Service, Alexandria, VA., 22309, 1980.

23.0 COMPETENCY/SKILL: Applies for a job.

23.1 **TASK:** Develops a personal resume.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given sample resume formats and wordprocessing equipment,

EVALUATION: develops a personal resume.

STANDARD: The resume will be typed without error and follow an appropriate format.

STUDENT LEARNING EXPERIENCES:

1. Explain the purposes of a resume.
2. Describe various ways in which a resume can be used.
3. Explain why a resume should be neat, complete, and accurate.
4. List the data which a resume should contain, and distinguish between appropriate formats for various employment situations.
5. Evaluate sample resumes and make suggestions for improvement.
6. Develop a draft of a personal resume.
7. Use a computer with wordprocessing software to input, format, and print a personal resume.
8. Use a computer to develop, format, and print a cover letter.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Have the class evaluate various resume formats for use in given horticultural business situations.
2. Discuss the importance of a cover letter as a sales tool to gain an interview.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Sample resumes and resume formats.
2. computer with wordprocessing software and printer.

RESOURCES:

MARKETING EDUCATION, Competency 2.1, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

23.0 **COMPETENCY/SKILL:** Applies for a job.

23.2 **TASK:** Interviews for a job.

PERFORMANCE OBJECTIVE:

CONDITIONS: Given an employment opportunity,

EVALUATION: interviews for a job.

STANDARD: An interview appointment will be made and kept; the company will be researched for employment and career potential; confident behavior demonstrated during the interview; and employment obtained.

STUDENT LEARNING EXPERIENCES:

1. Explain why appointments for interviews are important.
2. Demonstrate telephone contact with a potential employer.
3. Identify sources of information about horticultural employers.
4. Describe the types of information which are helpful in preparing for a job interview.
5. Describe types of questions which might be asked in a job interview.
6. Explain the importance of appropriate dress and grooming to a job interview.
7. Select appropriate clothing for an interview.
8. Describe appropriate grooming for a job interview.
9. Describe job interview behavior which demonstrates confidence.
10. Demonstrate techniques for answering questions in a manner which demonstrates confidence.
11. Describe techniques to be used when an interviewer asks questions which may be inappropriate or illegal.
12. Describe the types of questions which can, should,, or may reasonably be asked of an interviewer.
13. Determine whether the interviewer has the ability to make a firm job offer.
14. Ask the interviewer for the job if the position is desired at the close of the interview.

15. Follow up if/as appropriate with a letter or call indicating interest and availability.

16. Identify factors which may make a job undesirable or inappropriate.

17. Refuse a specific job offer if appropriate in a manner which leaves room for a more suitable job offer with the same firm.

SUGGESTED INSTRUCTIONAL TECHNIQUES:

1. Discuss the relationship of employer's and employee's as a mutually beneficial exchange in which both parties offer something of value.

2. Review appropriate strategies and sources of information for gaining local employment.

3. Review appropriate strategies and sources of information for gaining out of area employment.

4. Establish small group role playing situations where interview appointments are gained and interviews conducted.

5. Use a video camera to record and playback interview situations for critique.

6. Have school counseling or placement personnel address the class on job search and interview strategies.

INSTRUCTIONAL MATERIALS, EQUIPMENT, AND SUPPLIES:

1. Local papers, trade magazines, association bulletins and other sources of trade employment information.

2. Video recording and playback equipment.

RESOURCES:

MARKETING EDUCATION, Competencies 2.5, 2.8, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

ANNOTATED BIBLIOGRAPHY

Books

Derryberry, Bill, TROUBLE SHOOTING IRRIGATION CONTROL SYSTEMS, Bill Derryberry, ASIC, 1435 E. Florian AVE., Mesa, AZ., 85204, 1986.

Practical manual covering fundamentals of electricity, use of test meters, wiring, and valve repair. Non-technical language, very little theory; a concise guide to diagnosing and repairing irrigation systems for field personnel.

Duffield, Mary Rose, and Jones, Waren D., PLANTS FOR DRY CLIMATES, HP books, Tucson, Az., 85703, 1981.

Probably the most useful book available on plant material suitable and generally available for Arizona desert installation. This book should be in the library of any student who intends to work in the Arizona nursery or landscaping trades. It is profusely illustrated and often used as a sales tool in nurseries, garden centers, and landscape contracting situations.

Harbison, David G., and Johnson, Eric A. LANDSCAPING TO SAVE WATER IN THE DESERT, E&H Products, 71-301 Highway 111, Suite 1, Rancho Mirage, CA., 92271, 1985.

As direct as this title indicates, this is an excellent idea book dealing with ways to save landscaping water in the desert through appropriate irrigation design, plant selection, landscape design techniques, and native plant landscaping, It is fully illustrated, written by authors with credibility in the field, and suitable as a springboard to low water landscape creativity.

Vander, Kooi, Charles, ESTIMATING AND MANAGEMENT PRINCIPLES FOR LANDSCAPE CONTRACTORS, California Landscape Contractors Association, 2226 K. St., Sacramento, CA., 95816.

Thorough and practical treatment of landscape bidding and management principles. Covers job costing, workflow charts, daily job reports, overhead recovery, the bid process, cost accounting, and management by teamwork. A 50 page appendix contains worksheets and sample charts which can be used for self study or for classroom material. Mastery and implementation of this material can keep entry level entrepreneurs on a profit path.

AGRICULTURAL BUSINESS AND MANAGEMENT, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

Addresses topics in financial analysis, recordkeeping, management, and personal skills of value to the horticultural student.

AGRICULTURE POWER AND MACHINERY, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1986.

Competency based curriculum guide for the operation and maintenance of agricultural equipment, This area of study will be of particular benefit to students planning to perform maintenance in larger nursery and landscaping situations where the maintenance of heavy equipment is a vital operation. Sections on safe operation of equipment are valid at all levels.

ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

Practical approach to nursery operations, marketing, garden center sales, turf maintenance, and related issues. Contains much useful Arizona-specific information, and serves as the basis for certification as an Arizona Nursery Professional, a trade designated indication of career competency.

ARIZONA VOCATIONAL AGRICULTURE SOE PLANNING AND ACCOUNTING BOOK, Arizona Vocational Agricltural Teachers Association, Inc., Phoenix, AZ., 1984.

Financial and recordkeeping forms to be used in conjuction with the Supervised Occupational Experiences Program and as an introduction to financial and recordkeeping concepts.

FLORAL DESIGN AND MARKETING, Ohio Agricltural Education Curriculum Materials Service, Room 254, 2120 Fyffe Rd., The Ohio State University, Columbus, Ohio, 43210, 1099, 1987.

Thorough coverage of all aspects of the retail florist business from design through marketing and small business management. Good material on purchasing, pricing, and credit management.

FLORAL DESIGN SET PIECES, Ohio Agricultural Education Curriculum Materials Service, Room 254, 2120 Fyffe Road, The Ohio State University, Columbus, Ohio, 43210-1099, 1982.

Task Sheets detailing the construction of symmetrical triangle, horizontal, oval, asymmetrical triangle, right ankgle, and bud vase arrangments.

GREENSKEEPING, Pennsylvania Instructional Materials Service, University of Pennsylvania, 1981, available through Ohio Agricultural Education Curriculum Materials Service, Room 254, 2120 Fyffe Road, The Ohio State University, Columbus, Ohio, 43210-1099.

Golf course or greenskeeping-specific information on maintaining greens, collars, aprons, tees, sand traps and golf course equipment. Written to inform students or be used as a new employee training manual. Requires supplemental Arizona-specific information on turfgrass selection, pests, and watering but still a good, concise introduction to golf course maintenance operations.

GROUNDS MAINTENANCE ESTIMATING GUIDELINES, GROUNDS MAINTENANCE MANAGEMENT GUIDELINES, The Professional Grounds Maintenance Society, 3701 Old Court Rd., Suite 15, Pikesville, MD., 21208, 1986.

The manuals contain cost-generation information, estimating worksheets, maintenance task chart, job forms, labor cost worksheet, capital cost calculations machine cost worksheet and approach to grounds maintenance, and useful to any small contractor or entrepreneur who realizes that mowing lawns is probably the least intriguing aspect of the business of grounds maintenance.

HORTICULTURAL STUDENT MATERIALS, CAT., #31A, 31B, Unit P, Vocational Instructional Services, F.E. Box 182, College Station, Tx., 1985

Student materials companion to INTRODUCTION TO ORNAMENTAL HORTICULTURE, above; can be used on its own to present a strong overview of horticultural background, trades, and activities.

INTERIOR LANDSCAPING, Prentice Hall, Englewood Cliffs, N.J. 1983, available through Ohio Agricultural Curriculum Materials Service, Room 254, 2120 Fyffe Rd., The Ohio State University, Columbus, Ohio, 43210-1099.

A well illustrated guide to the design and care of interior landscapes for offices and homes. Soils, plant materials, containers, light requirements, watering, fertilization, and insect and disease controls are addressed.

INTRODUCTION TO ORNAMENTAL HORTICULTURE, Catalog #s 115A, 115B, 115C, Vocational Instructional Services, Texas A&M, F.E. Box 182, College Station, Tx., 1985.

This contemporary, very comprehensive, looseleaf format text covers most areas of horticultural operations in significant detail and contains useful classroom presentation material including charts, graphs, and transparency masters. It is a superior single source of horticultural information and will provide a strong information base for horticultural instruction.

MARKETING EDUCATION, Arizona Center for Vocational Education, Center for Excellence in Education, Northern Arizona University, 1987.

An excellent guide to principles of marketing and management with very useful material in the areas of entrepreneurship, creation of business plans, financial analysis, and personal skills. Cross training in marketing will be of great value to horticulture students interested in wholesaling, retailing, and horticultural management.

RAIN BIRD LANDSCAPE DRIP IRRIGATION DESIGN MANUAL. Rain Bird Sales Inc., Turf Division, 145 N. Grand Ave., Glendora, CA., 91740, 1984.

A powerful short course in the characteristics and specifications of drip irrigation systems, good balance of theory and how to. While drip irrigation is not particularly new, it is still under used and to some extent misunderstood. This manual describes proper design of systems particularly suited to Arizona ecosystems at both low and high altitudes.

STUDENT REFERENCE ON TURF MANAGEMENT, Specialized Curriculum in Horticulture, Student Reference Number Seven, Department of Agricultural Education, University of Arizona, Tucson, AZ., 1971.

Turf selection and management information specific to Arizona environments.

THE BALL REDBOOK, Prentice Hall, Englewood Cliffs, N.J. 1985, available through Ohio Agricultural Education Curriculum Materials Service, Room 254, 2120 Fyffe Rd., The Ohio State University, Columbus, Ohio, 43210-1099.

The frequently updated REDBOOK is the industry standard reference guide for the production of most greenhouse related crops. It is an ongoing project of the George W. Ball Company, a major supplier to the greenhouse trade and should be a part of the basic library of anyone concerned with production of flowering crops and bedding plants. Additionally, the REDBOOK contains excellent information on the use of horticultural chemicals, growing media, structures, and management. BALL also publishes a monthly magazine, GROWER TALKS, which contains sophisticated discussion of current greenhouse related issues and techniques.

THE NEW PESTICIDE USERS GUIDE, Prentice Hall, Englewood Cliffs, N.J. 1983, also available through Ohio Agricultural Curriculum Materials Service, The Ohio State University, Room 254, 2120 Fyffe Rd, Columbus, Ohio, 43210-1099.

Contains thorough coverage of insects, weeds, vertebrate pests, plant diseases, invironmental considerations, labels, laws and liability, equipment, calibration, decontamination, disposal, and recordkeeping.

TORO PLANNING AND INSTALLATION GUIDE, Form #4902155, HP586200M, The Toro Company, Dept., RM., 5835 Jasmine St., Riverside, CA., 92504.

Concise and very clear guide to the design and installation of lawn and shrubbery irrigation systems. The bulletin is widely available through Toro irrigation distributors and would make an excellent student study guide and project completion form.

Brochures

ALL ABOUT LANDSCAPING
ALL ABOUT LAWNS
ALL ABOUT PRUNING
GARDEN CONSTRUCTION KNOW HOW
HOW TO DESIGN AND BUILD DECKS AND PATIOS
HOW TO SELECT, USE AND MAINTAIN GARDEN EQUIPMENT, Ortho books, Chevron Chemical Company, Consumer Products Division, 575 Market St., San Francisco, CA., 94105.

Ortho series of books on lawn, garden, landscaping, and maintenance operations are profusely illustrated, clearly written, and easy to understand. They serve not only as an "introduction" to the subject matter, but in fact cover about 95 per cent of the situations a residential landscape or grounds maintenance person is likely to encounter. There are certainly more complicated and detailed texts available, but few that are clearer and more practical for standard situations.

"Apply Pesticides Correctly" USDA/EPA bulletin in ARIZONA CERTIFIED NURSERY PROFESSIONAL TRAINING MANUAL, Arizona Nursery Association, Phoenix, AZ., 1981.

Straight forward discussion of safe pesticide application procedures which should enable an operator to proceed with confidence.

Audiovisual Materials

CORSAGE CONSTRUCTION, Ohio Agricultural Education Curriculum Materials Service, Room 254, 2120 Fyffe Rd., The Ohio State University, Columbus, Ohio, 43210-1099, 1980.

101 Color slides and detailed script illustrating the design and construction of corsages.

DRIED MATERIALS, Ohio Agricultural Education Curriculum Materials Service, Room 254, 2120 Fyffe Rd., The Ohio State University, Columbus, Ohio, 43210-1099, 1978.

Slides and script format illustrating materials used in dried arrangements identified by common and botanical names.

FLORAL TRIBUTES, Ohio Agricultural Education Curriculum Materials Service, Room 254, 2120 Fyffe Rd., The Ohio State University, Columbus, Ohio, 43210-1099, 1981.

112 Color slides and text detailing design and assembly of floral pieces for funerals. Step by step construction guide for casket sprays, wreaths, pillow arrangements, etc.